

BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1935 ROYAL BOTANIC GARDENS, KEW

I.—THE GENUS *CLYPEOLA* AND ITS INTRASPECIFIC VARIATION. D. A. CHAYTOR and W. B. TURRILL

The genus *Clypeola* is a small genus of annual cruciferous herbs, limited in distribution to the Mediterranean Region. In many characters it shows resemblances to the much larger genus *Alyssum*. It is distinguished especially by ripening only one seed in a fruit, the latter being normally indehiscent till the commencement of germination, i.e. technically the fruit is an achene derived from a silicule. Two ovules in an ovary have been observed, at least once, though usually only one is present.

We accept nine species of *Clypeola*, including one (*C. Raddeana* Alb.) which is doubtful. These species are clearly distinguishable one from another by morphological characters and partly also by geographical distribution. The most widely distributed species is *C. Jonthlaspi* L. This occurs over most or all of the area covered by the genus. It is also by far the most polymorphic species and for this reason is the most difficult, but the most interesting, taxonomically.

In the account which follows we refer briefly to the Linnean and immediately pre-Linnean history of the genus, give a key to the species, descriptions of the species with their distribution, synonymy, and intraspecific variation, and conclude with a discussion of the results of the investigation as it bears on wider taxonomic problems.

GENERIC HISTORY.

Linnaeus based his genus (Gen. Plant. ed. 1, 193: 1737) on Tournefort's *Jonthlaspi* (Tournefort, Instit. 210, t. 99: 1719). The two species recognized by Tournefort are: "1, *Jonthlaspi luteo flore*, incanum, montanum, Δισκοιδὲς Col. Part. I. 280. *Thlaspi saxatile*, incanum, luteum, *Serpilli folio*, minus C.B. Pin. 107. 2, *Jonthlaspi minimum*, *spicatum*, *lunatum* Col. Part. I. 284. *Thlaspi clypeatum*, *Serpilli folio* C. B. Pin. 107. *Lunaria peltata*, *minima quibusdam*, ad *Thlaspi* referenda J.B. 2. 935."

Of these the former is probably a species of *Alyssum*; the latter is, from Columna's (Colonna's) figure, undoubtedly *Clypeola Jonthlaspi* as now understood and is probably the variety with medium or large fruits and hairy disc and wing. It is quoted by Linnaeus, Sp. Pl. 652 (1753) under his *C. Jonthlaspi*. Miss Green is, therefore, quite correct in accepting *C. Jonthlaspi* as the type species of the genus *Clypeola* (Kew Bull. 1925, 53).

In the Species Plantarum (p. 652: 1753) four species are included in the genus: *C. Jonthlaspi*, *C. Alyssoides*, [*C. tomentosa*], and *C. maritima*. In the second edition (p. 910: 1763) only *C. Jonthlaspi* and *C. maritima* are retained. Of the Linnean species *C. maritima* is now placed in *Alyssum* [as *A. maritimum* (L.) Lam.], in *Lobularia* [as *L. maritima* (L.) Desv.], or in *Koniga* [as *K. maritima* (L.) R. Brown]. There are two specimens in the Linnean Herbarium. *C. alyssoides* is now relegated to *Alyssum* as *A. alyssoides* (L.) L. Syst. ed. 10, 1130 (1759), with *A. calycinum* (L.) Sp. Pl. ed. 2, 908 (1763) as a synonym. The name *C. tomentosa* was not printed (marginally) in the first edition of the Species Plantarum though the description, reference, and synonym are given. The name was first published in Mant. 92 (1767) and is thus antedated by *Alyssum orientale* Ard. Animad. Alt. 32 (1759). There is one specimen in the Linnean Herbarium which is written up as *A. Orientale* Ard.

C. Jonthlaspi L. is finally based on Columna's figure [Fabii Columnae Lyncei 284 (1616)]. The species is well established from this figure and the accompanying description and the actual variety represented may be that with medium or large fruits (over 3 mm. broad), hairy wing, and hairy disc. It is, however, not possible to be quite certain. In the Linnean Herbarium there is one sheet with four specimens. The stems are up to 8.5 cm. high and the leaves narrowly oblanceolate-spathulate. In three specimens the fruits have 4 mm. diam. and hairy disc and wing, in one specimen 4 mm. diam. and glabrous disc and hairy wing.

Modern generic descriptions are given in Benth. et Hook. fil. Gen. Pl. 1, 65, 93 (1862) and in Engler u. Prantl. Pflanzenfam. III. 2. 194-5 (1891).

KEY TO SPECIES.

1. Planta haud divaricatim ramosa, infructescentiis elongatis.
2. Siliculae 6 mm. diam., vel saepissime angustiores, haud grosse crenulatae.
3. Siliculae membranaceae alatae.
4. Siliculae ala plana.....1. *C. Jonthlaspi* L.
- 4.* Siliculae ala torquatim inflata.....
2. *C. elegans* Boiss. et Huet.
- 3.* Siliculae haud membranaceae alatae.
5. Siliculae hirsutae, lanatae vel setosae.
6. Siliculae pilis laevibus vel fere laevibus hirsuta vel densissime lanata.
7. Siliculae usque ad 4 mm. latae, pilis adpressis instructae densissime ciliatae.....
3. *C. ciliata* Boiss.
- 7.* Siliculae usque ad 6 mm. latae, pilis longissimis albis obtectae.....4. *C. eriocarpa* Cav.
- 6.* Siliculae setis rigidis retrorsum barbellatis echinatae.

8. Petala 2.5 mm. longa ; stylus 0.5 mm. longus ;
pedicelli fructiferi arcuato-recurvi.....
5. *C. aspera* (Grauer) Turrill.
8.* Petala 3.75–4 mm. longa ; stylus 1.5 mm. longus ;
pedicelli fructiferi abrupte recurvi.....
6. *C. lappacea* Boiss.
5.* Siliculae tuberculatae.....7. *C. Raddeana* Alb.
2.* Siliculae 9 mm. diam., grosse crenulatae.....
8. *C. cyclodonteia* Delile.
1.* Planta divaricatim ramosa, infructescentiis vix elongatis quam
ramis junioribus brevioribus.....9. *C. dichotoma* Boiss.

DESCRIPTIONS OF SPECIES AND VARIATIONS.

1. *C. Jonthlaspi* L. Sp. Pl. 652 (1753).

An annual erect plant with slender stems, slightly to much branched at the base, up to 2.8 dm. high, but generally much shorter. Tap-root slightly or much branched, almost vertical. *Stems* terete, covered with closely adpressed small, greyish-white, stellate hairs with numerous long branches. *Leaves* narrowly oblanceolate to spatulate-oblanceolate or obovate, subacute to obtuse, narrowed below, 0.2–2.0 cm. long, 1–4 mm. broad, covered with stellate hairs, similar to those on the stem, on both surfaces, very dense on the lower, midrib (in dried material) slightly prominent on lower surface ; leaves often fall off as fruit reaches maturity. *Inflorescence* in the young condition very compact, lengthening with age, axis with indumentum similar to that of the stem, ebracteate, ebracteolate ; flower pedicels 1–2 mm. long. *Sepals* ovate to elliptic, subacute to obtuse, 0.9–1.75 mm. long, stellate hairs on outer surface, narrow membranous margin, persistent in young fruit, then caducous. *Petals* linear, elliptic or spatulate-oblanceolate, entire and obtuse, or slightly emarginate, 0.75–1.75 mm. long, well-defined midrib sometimes present, glabrous. The four longer *stamens* usually about 1.5 mm. long, filaments asymmetrically flat-winged, in the lower $\frac{1}{2}$ or $\frac{1}{3}$. On the adaxial side the wing much broader, ending in an erect acute tooth (occasionally bifurcated) about 0.5 mm. long ; the two shorter stamens about 1.25 mm. long, with a membranous appendage arising from near the base on the adaxial side, flattened dorsiventrally, with two acute apical teeth. *Gynoecium* 0.75–1 mm. long excluding style up to 0.25 mm. long ; ovary orbicular-elliptic, compressed, glabrous. *Fruit* ovate, obovate, suborbicular, orbicular-elliptic, or orbicular, 1.75–5.25 mm. long, 1.5–5 mm. broad, margin entire, apex slightly emarginate, style concealed in emargination, wing and disc or disc only or wing only covered with numerous long, tapering verruculose hairs interspersed with very numerous minute, irregularly verruculose hairs, or entirely glabrous ; fruiting pedicels 1.5–3 mm. long, recurved. *Seed* elliptic, compressed, bi-convex, 0.75–1.25 mm. broad, 1.0–1.75 mm. long.

General synonyms : *Alyssum minimum* Villars, Hist. Pl. Dauph. 3, 292, 296 (1789) non L. sec. Verlot in Bull. Soc. Stat. Isère, 3me. sér., 3, 26 (1872).

Ionthlaspi clypeolatum Caruel in Parlatore, Fl. Ital. 9, 1049 (1893).

The above description of *C. Jonthlaspi* is a generalized one made to include a very wide range of material which for reasons given in our discussion (p. 22) we place under one polymorphic species. The range of variation includes such characters as habit, height, branching, leaf-size, degree of indumentum on vegetative parts, and fruit size, shape and indumentum. The variation is undoubtedly partly due to genetic differences, partly to reaction to different environmental conditions. Our experience suggests that the fruit characters are least easily modified by changing environments and therefore give the best diagnostic characters. This also appears to be the conclusion reached by most other authors who have studied the species. On the other hand some of the characters of the fruit, especially size, which is most conveniently stated in terms of silicule breadth, show a graded series of intermediate development. There is a considerable degree of correlation between fruit size and the size of the plant as a whole. Leaf-size and the amount of indumentum on the vegetative parts appear to be easily modified by habitat conditions.

In the following account of intraspecific variation we have divided the material studied into a number of variants, firstly, on the presence or absence and, if present, the distribution of hairs on the silicules and, secondly, on the fruit size. The following symbols enable a simple formula to be given to any specimen with mature fruit :

w=wing (in many previous descriptions referred to as margin, margo).

d=disc—the central portion of the silicule.

H=hairy.

G=glabrous.

L=large, the total diameter (wing and disc) of the silicule, 3.5 mm. or upwards.

M=medium, the total diameter of the silicule between 3.5 and 2.5 mm.

S=small, the total diameter of the silicule 2.5 mm. or less.

The following combinations are then possible :

var. 1. w H d H L=var. *pubescens* Car. et St. Lager.

var. 2. w H d H M=var. *lasiocarpa* Guss.

var. 3. w H d H S=var. *hispida* (Presl) Hal.

var. 4. w H d G L=var. *intermedia* Hal.

var. 5. w H d G M=var. *glabriuscula* Gruner.

var. 6. w H d G S

var. 7. w G d H L

var. 8. w G d H M

var. 9. w G d H S=var. *microcarpa* (Moris) Arcang.

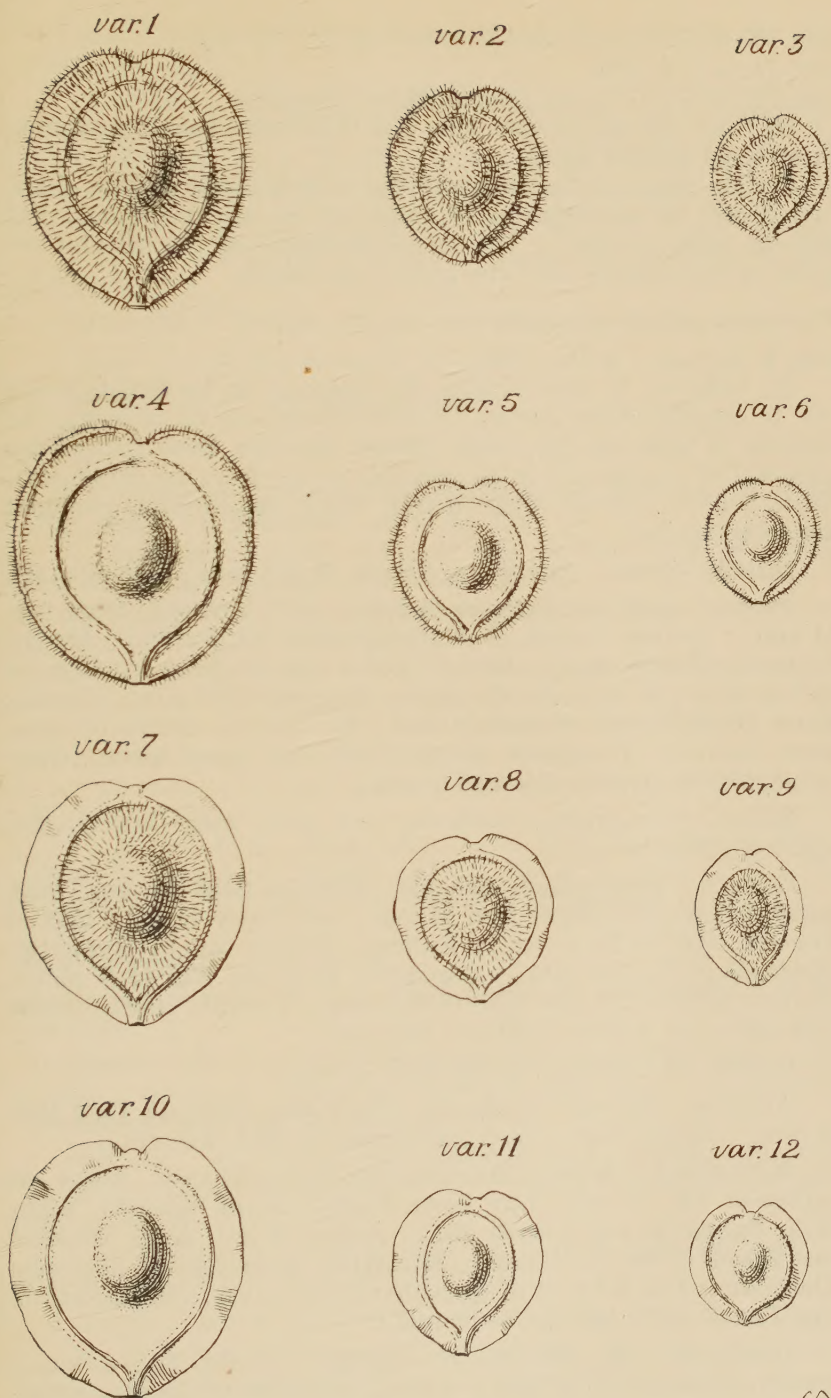


Fig. 1. Fruits of varieties of *Clypeola Jonthlaspi* $\times 6\frac{3}{4}$. The figure of var. 7 has been constructed by combining characters of other varieties, no specimens having been seen. The remaining varieties have been studied in living and/or dried material.

var. 10. w G d G L=var. *lejocarpa* Vis.

var. 11. w G d G M

var. 12. w G d G S=var. *glabra* (Boiss.) Reynier.

Of these all except var. 7 (w G d H L) have been represented in material studied by us.

Certain minor variations involving modifications of fruit shape and degree of development of indumentum are mentioned, but without using symbols. The actual diameters of the silicules are given in parentheses after the quoted specimens.

Variations in fruit characters :

var. 1, formula : w H d H L.

In addition to this formula there appear to be modifications due to supplementary factors for intensifying and for reducing the number of hairs on the fruits, though whether these factors are genetical or ecological it is not possible to say from available data. There is also a certain range in fruit shape and extreme examples are noted below.

Distrib.—SPAIN : Tarragona, *Sennen* (4·4·5 mm., hairs sparse).

FRANCE : Avignon, *Delacour* (4 mm.) ; cult. Mentone, *Moggridge* (4 mm.) ; Toulon, *Durieu de Maisonneuve* 15 (3·75 mm.) ; Aix-en-Provence (3·3·75 mm.) ; Beziers (3·5–4 mm.) ; Avignon, *Requien* (3·5–4 mm.) ; St. Jean de Maurienne, *Huguenin* (3·5 mm.) ; Drome, *Roux* (3·5–4·5 mm., rounded fruits) ; Montpellier, *Delile* (4 mm., fruit rounded) ; Perpignan, *Southby* (3·5 mm., hairs sparse) ; Grenoble, Mt. St. Eynard, *Blanc* (3–4 mm.).

SICILY : in montibus, *Gasparini* (3·5 mm., wing densely, disc sparsely hairy).

GREECE : Megaspilaion Achaiae, *Heldreich* 3484 (4 mm., very hairy fruits) ; Parnassus, *Mill* (4 mm., very hairy fruits) ; Pass of Decelea, *Mill* (3·75–4 mm.) ; Eurotas, *Mill* (4 mm.) ; Hymettus, *Heldreich* 3276 (3·5 mm.) ; *Corydalis* *Heldreich* 822 (4·5 mm.) ; Parnes, *Atchley* 227 and 1066 (3·5–4 mm.) ; Corinth, *Atchley* 1624A (4·5 mm.) ; nr. Athens, *Heldreich* (4·5 mm.).

CORFU : St. Salvador, *Talbot* (3·75–4 mm.).

ALBANIA : Melesinë, Leskovik, *Alston and Sandwith* 1769 (4·5–5 mm.) ; Gjinokastrë, *Alston and Sandwith* 1514 (4·5 mm.).

MACEDONIA : between Breznitsa and Krystallopegae, *Alston and Sandwith* 743 (5 mm., very hairy fruits) ; N. of Salonika, Mikra, *Hill, Sandwith, and Turrill* 2617 ; Asbestochoroi, *Hill, Sandwith, and Turrill* 2658c (3·75 mm.) ; Mt. Athos, Kapsokalivia Zographu, Dochiariou and between Kapsokalivia and Lavra, *Hill, Sandwith, and Turrill* 2471, 2487 (3·75–4·5 mm.).

DALMATIA : Mt. Marian, nr. Spalato, *Pichler* (3·5–4 mm.) ; Lesina, *Alexander* (3·75 mm.) ; Lesina, *Alexander Prior* (3–4 mm.).

CRIMEA : Nikita, *Wankow* (4 mm.).

CYPRUS : *Pentedactylos*, *Sintensis* and *Rigo* 270 (4.4-5 mm., rounded fruits).

ASIA MINOR : Renkoei Dumbrek, *Sintensis* 1000 (3.5 mm.) ; Amasia, *Bornmüller* 1344 (3.5 mm., hairs sparse) ; Antiphellus, *Forbes* 49 (3.5 mm.) ; Katara Pass, *Forbes* 50 (3.5-3.75 mm.) ; Armenia, *Szovits* (3.5-4.5 mm., hairs short) ; Mardin, *Haussknecht* (3.5-4 mm.) ; Armenia, Gumusch-Khané, *Bourgeau* 40 (3.5 mm.).

CAUCASUS : *Wilhelms* (3.5 mm.) ; Herb. Mus. Petrop. (4 mm., rounded fruit).

PALESTINE : Medaba, *Meyers* and *Dinsmore* (3 mm.).

'IRAQ : Terek, *Haussknecht* (3.5 mm.).

SYRIA : *Aucher-Eloy* 360 (3.5 mm.).

Synonyms.

C. Jonthlaspi L. var. *lasiocarpa* Gruner in Bull. Soc. Imp. Nat. Mosc. 40, Pt. 2, 396 (1867) (or to var. 2).

C. Jonthlaspi L. var. *pubescens* Car. et Saint-Lager Etude des fleurs 61 (1889)—sec. Rouy et Fouc.

C. Jonthlaspi L. var. *suffrutescens* Debosc. et Neyr. in Bull. Soc. Hist. nat., Toulouse 1891, p. x.

Jonthlaspi clypeolatum Caruel var. *macrocarpa* Caruel in Parlatore Flor. Ital. 9, 1049 (1893) (or to var. 4, or to var. 7, or to var. 10).

C. suffrutescens Rouy et Fouc. Flor de Fr. 2, 162 (1895) (woody, suffruticose stems branched from the base).

C. Jonthlaspi L. var. *lasiocarpa* Strobl in Verh. zool.-bot. Ges. 53, 457 (1903).

C. Jonthlaspi L. subsp. *macrocarpa* Fiori var. *petraea* Fiori e descr. in Flor. Ital. Exsicc. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. 17, 610 (1910)—? excl. syn. Jord. et Fourr.

var. 2, formula : w H d H M.

Two subvariations are noted below as modifications of this formula.

Distrib.—SPAIN : Sierra de Segura, *Bourgeau* 568 (3 mm., hairs sparse) ; Granada, *Ellman and Sandwith* 567 (2.75 mm.) ; Almeria, *Ellman and Sandwith* 897 (3-3.5 mm.).

FRANCE : Mt. Cette, *Gay* (2.75-3 mm.) ; Ribiers, *Reverchon* (3 mm.) ; Lot, *Puel* (3.25 mm.) ; Montpellier, *Bentham* (3 mm.) ; Marseilles, *Billot* (2.75 mm.).

ITALY : Gargano, *Porta et Rigo* 148 (2.75-3 mm.) ; Etruria, Ins. Capraria, *Fiori and Beguinot* 1278 (3 mm.).

CORSICA : Bastia, *Salis* (3.4 mm.).

MACEDONIA : N. of Salonika, Mikra, *Hill, Sandwith, and Turrill* 2617, 2662 (2.5-3.5 mm.) ; Asbestochoroi, *Hill, Sandwith, and Turrill* 2581, 2658B (2.5-3 mm.).

ATHOS PENINSULA : Zographu and Simopetra, *Hill, Sandwith, and Turrill* (2.75–3.25 mm.).

THRACE : Mesta Valley, *Tedd* (3 mm.).

CRIMEA : Jalta and Massandra, *Golde* 1006 (3 mm.); Tauria, *Sokoll, Callier* 14 (3 mm.).

ASIA MINOR : Scutari, *Noé* (2.5–3 mm.); Egin, Szanduk, *Sintensis* 2275, (2.5–2.75 mm.); Kurdistan, *Batos, Guest* 578 (3 mm.).

PALESTINE : E. of Jordan, *Paine* (3 mm.); Rasheiyd (*ex herb. Post*) (3 mm.); Ain karim, *Edwards* 37 (3 mm.); Medaba, *Meyers and Dinsmore* (2.5–2.75 mm.).

SYRIA : Aleppo, *Kotschy* (3 mm.).

IRAQ : Euphrates, *Gorluk, Chesney* (2.75 mm.).

PERSIA : Kaman, *Pichler* (2–2.5 mm.).

BALUCHISTAN : Urak, *Lace* (3 mm.).

AFGHANISTAN : 1403 Distr. Cab., *Griffith* (2.5–3 mm.).

ARABIA PETRAEA, *McDonald* (2.5–3 mm.); *Schimper* 432 (2.75 mm.); Sinai, *Schimper* 415 (2.75 mm.).

ALGERIA : Mostaganem, *Balansa* 3 (2.75 mm.).

Synonyms.

C. monosperma Lam. Fl. Fr. **2**, 462, 484 (1778) (or to var. 1 or 3).

C. Jonthlaspi L. var. *lasiocarpa* Guss. Flor. Sic syn. **2**, i. 145 (1843) (from description; to var. 1 according to quoted figure).

C. hispidula Jord. et Fourr. Brev. Plant. Nov. **2**, 15 (1868) (or to var. 3).

C. petraea Jord. et Fourr. Brev. Plant. Nov. **2**, 14 (1868) (or to var. 1).

C. Jonthlaspi L. f. *Bruhnsii* Bush in Flor. Cauc. Crit. Cruciferae, 614 (1910).

C. Jonthlaspi L. var. *lasiocarpa*, forma *spathulifolia* Fiori in Flor. Ital. Exsicc. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. **17**, 610 (1910) excl. syn.

C. Jonthlaspi L. var. *petraea* Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

C. Jonthlaspi L. var. *hispidula* (Presl.) Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

Subvariation A. Hairs short and rather sparse.

Distrib.—SWITZERLAND, Valais; Bramois, *Hooker* (3 mm.); Sion, *Hooker* (3 mm.); Sion, *Wolf* (2.75–3 mm.).

Synonyms.

C. Gaudinii Trachsel in Flora **14**, 743 (1831).

C. Gaudinii Trachs. var. *lasiocarpa* Strobl. in Verh. zool.-bot. Ges. **53**, 457 (1903).

C. Jonthlaspi L. var. *Gaudinii* Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

C. Jonthlaspi L. a. *Gaudinii* (Trachs.) b. *lasiocarpa* Lanza in Boll. Ort. Bot. Palermo **4**, 27 (1905) e descr.

C. Jonthlaspi L. subsp. *Gaudinii* (Trachs.) Fiori var. *typica* Fiori in Flor. Ital. exsicc. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. **17**, 611 (1910), et Thellung in Hegi Ill. Flor. Mitt.-Eur. **4**, i, 458 (1919).

Subvariation B. Hairs on wing dense, short, and clavate.

Distrib.—CORSICA : *Rambur* (3 mm.).

Synonyms.

C. spathulifolia Jord. et Four. Brev. Plant. Nov. **2**, 15 (1868).

C. hispida Presl. var. *spathulifolia* Rouy et Fouc. Fl. Fr. **2**, 164 (1895).

var. 3, formula : w H d H S.

Distrib.—SPAIN : Aranjuer, *Graels* (2·5 mm.) ; Reuter (2·25 mm.) ; Cerro la Matanza, *Willkomm* 70 (2 mm.) ; Granada, Alhambra, *Gourlay, Richards and Tutin* (2 mm.).

FRANCE : Chamonix (2·5 mm.) ; Marseilles, *Billot* (2·5 mm.).

SWITZERLAND : Tourbillon, Sion *Lagger* (2·5 mm., hairs sparse) ; Sion, *Thomas* (2·5 mm.) ; Lougeborgue, Valais, *Chenevard* (2·5 mm.).

SICILY : Castellbuono, *Strobl* (2·5 mm.).

GREECE : Pentelikon, *Pichler* (2·5 mm.) ; Corinth, *Atchley* 1625A, (2 mm.) ; Promontory of Munychea, *Mill* (1·75 mm.).

MACEDONIA : N. of Salonika, Asbestochoroi, *Hill, Sandwith, and Turrill* 2658A (2·25 mm.).

CONSTANTINOPLE : *Noé* 259 (2·5 mm.).

ASIA MINOR : Tokat, *Aucher-Eloy* 4081 (2·5 mm.).

IRAQ : Gorluk, *Chesney* 51 (2·5 mm.).

ARABIA : Sinai, *Schimper* 415 (2·25 mm.).

ALGERIA : Batna, *Choulette* 8 (2·5 mm.).

Synonyms.

C. hispida Presl. Bot. Bemerk. 9 (1844) (or to var. 2—the type is *Schimper* 415, from Sinai, and specimens at Kew of this number belong partly to var. 2 and partly to var. 3. No measurements are given in the original description.)

C. Bruhnsii Gruner in Bull. Soc. Imp. Nat. Mosc. **40**, Pt. 2, 396 (1867) ?

C. microcarpa Moris var. *hispida* Hal. Consp. Fl. Graec. **1**, 117 (1900).

C. Jonthlaspi L. subsp. *Gaudinii* (Trachs.) Fiori var. *lasiocarpa* Fiori p.p. (and to var. 2) in Flor. Ital. exsicc. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. **17**, 610 (1910).

C. Jonthlaspi L. var. *hispida* Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

C. Jonthlaspi L. subsp. *Gaudinii* (Trachs.) Thell. var. *microcarpa* (Moris) Arcang. subvar. *hispida* (Presl. non Rouy) Jahandiez et Maire in Cat. Pl. Maroc. **2**, 307 (1932).

In addition to the specimens quoted above a number (collected by *Bordère*, *Huter* and *Lagger*) from the Gavarnie district, French Pyrenees, are to be placed under this variety. All specimens seen from this locality have small or very small fruits (1.5–2.5 mm.) with hairy or slightly hairy, to glabrous wings, and more or less hairy discs. Those specimens with no hairs on the wings might technically be classed under var. 9, but have not the dense white disc indumentum. The Gavarnie population is apparently an isolated one, at an unusual altitude for the species, and the name *C. pyrenaica* *Bordère* in Actes Soc. Linn. Bord. **26**, 85 (1866) has been applied to it, reduced to *C. Jonthlaspi* L. var. *pyrenaica* Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

var. 4, formula : w H d G L.

Distrib.—FRANCE : Villeneuve, *Delacour* (4.4–5 mm.) ; *Marseilles*, *Tribout* (3.75 mm.) ; Mireval, *Bentham* (5 mm.) ; nr. *Vaucluse*, *Antunan* (3.5–4 mm.) ; *Vaucluse*, *Reverchon* (3.5 mm.) ; *Narbonne*, *Fourcade* (3.25–4 mm.) ; *Nice*, *Woods* (4 mm.) ; *Montpellier*, *Bentham* (4 mm.) ; *Bentham & Arnott* (4.5 mm.).

ITALY : *Naples*, *Hooker* (3 mm., fruit rounded).

GREECE : *Corinth*, *Atchley* 1624c (3.5–4 mm.) ; *Pass of Decelea*, *Mill* (4.5 mm.) ; *Hymettus*, *Heldreich* 822 and 3276 (4 mm.).

MACEDONIA : *Lembet*, *Turner* (4.5 mm.) ; *N. of Salonika*, *Mikra*, *Hill*, *Sandwith*, and *Turrill* 2663 (4–5 mm.) ; *Asbestochoroi*, *Hill*, *Sandwith*, and *Turrill* 2582, 2657 (4–4.5).

DALMATIA : *Mt. Marian*, *Spalato*, *Pichler* (3.75 and 4 mm.).

CRIMEA : *Sokoll*, *Callier* 14 (3.5–4 mm.).

ASIA MINOR : *Amasia*, *Bornmüller* 1346 (4.5 mm.) ; *Smyrna*, *Fleischer* (4.5 mm.) ; *Renkoei*, *Mt. Ulu-Dagh*, *Sintensis* 1052 (4.5–5 mm.) ; *Chio*, *Aucher-Eloy* 284 (4.5 mm.).

CYPRUS : *Pentedactylos*, *Sintensis et Rigo* 270 (4 mm.).

SYRIA : *Aleppo*, *Kotschy* (4 mm.).

PALESTINE : *Medaba*, *Meyers and Dinsmore* (3.5 mm.).

'IRAQ : *Terek*, *Haussknecht* (5 mm.) ; *Gorluk*, *Chesney* 51 (3.5 mm.) ; *Assyria*, *Dejebel Taktak*, *Haussknecht* (3.75–4 mm.).

Synonyms.

C. lapidicola Jord. et Fourr. Brev. Plant. Nov. **2**, 14 (1868).

C. semiglabra Jord. et Fourr. ex Fourr. in Ann. Soc. Linn. Lyon, nouv. sér. **16**, 334 (1868) et op. cit. **17**, 194 (1869).

C. Jonthlaspi L. var. *intermedia* Hal. Consp. Fl. Graec. **1**, 117 (1900) p.p.

C. Jonthlaspi L. var. *lejocarpa* Strobl. in Verh. zool.-bot. Ges. **53**, 457 (1903).

C. Jonthlaspi L. var. *lapidicola* Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

var. 5, formula : w H d G M.

Distrib.—FRANCE : Marseilles, Tribout (3 mm.) ; Carpaigne, Billot 3318 (3 mm.).

CORSICA : Bastia, *Salis* (3-3.5 mm.).

MACEDONIA : N. of Salonika, Asbestochoroi, *Hill, Sandwith, and Turrill* 2583, 2656 (2.75-3.5 mm.).

Synonyms.

C. Jonthlaspi L. var. *glabriuscula* Gruner in Bull. Soc. Imp. Nat. Mosc. **40**, Pt. 2, 396 (1867) (or to var. 4).

C. ambigua Jord. et Fourr. Brev. Plant. Nov. **2**, 15 (1868) (or to var. 6).

C. lomatotricha Jord. et Fourr. ex Fourr. in Ann. Soc. Linn. Lyon, nouv. sér. **16**, 334 (1868) et op. cit. **17**, 194 (1869).

C. Jonthlaspi L. var. *intermedia* Hal. Consp. Fl. Graec. **1**, 117 (1900) p. p.

C. Gaudinii Trachs. var. *lejocarpa* Strobl in Verh. zool.-bot. Ges. **53**, 457 (1903) ?

C. Jonthlaspi L. subsp. *Gaudinii* (Trachs.) Fiori var. *ambigua* (Jord. et Fourr.) Fiori in Flor. Ital. Exsicc. Ser. II. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. **17**, 610 (1910). (or to var. 6.).

C. Jonthlaspi L. var. *ambigua* Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

var. 6, formula : w H d G S.

Distrib.—CRIMEA : Inkerman, *Crichton* (2.5 mm.).

var. 7, formula : w G d H L.

No specimens seen.

var. 8, formula : w G d H M.

Distrib.—BALEARIC IS.: Majorca, Pollanza, *Edmonds* 66 (3 mm.); *Edmonds* 262 (3 mm.).

SICILY : Mt. Madoniarum, *Strobl* (2.5-3 mm., fruit orbicular).

GREECE : Corinth, *Atchley* 1624B (2.5-2.75 mm.).

Synonyms.

C. messanensis Tin. ex Strobl in Verh. zool.-bot. Ges. **53**, 457 (1903).

var. 9, formula : w G d H S.

The plants under this formula have very uniform fruit characters. The short dense compact white indumentum of the disc being very conspicuous, when examined under the lens, and the obovate-elliptic shape is shown by all the material.

Distrib.—FRANCE : nr. Montpellier, *Planchon* (1·5–2 mm.) ; St. Juilhen le Désert, *Moggridge*, *Planchon* (2–2·5 mm.) ; Mt. Alaric, Aude, *Durieu* (2 mm.) ; Mt. Alaric, *Burdigal* (2 mm.) ; Montpellier, *Delacour* (2–2·5 mm.) ; Carpaigne nr. Marseilles, *Billot* 3318 (2 mm.).

SPAIN : Almeria, Velez-Rubio, *Ellman and Sandwith* 960 (2 mm.) ; Serra de Baya, *Bourgeau* (2·25 mm.) ; Sierra de la Nieva, Ronda, *Hubbard*, 1182 (2 mm.) ; Sierra Tejada, *Willkomm* 70 (2 mm.).

GREECE : Hymettus, *Heldreich* 823 (2 mm.).

ALBANIA : Gjinokastrë, Mali Lunxheriës range, *Alston and Sandwith* 2194 (2 mm.).

MACEDONIA : Athos, *Grisebach* (2·25 mm.).

ASIA MINOR : Lycia, Elmalu, *Bourgeau* (2 mm.).

Synonyms.

C. microcarpa Moris in Att. terz-riun. degli Scienz. Ital. 539 (1841).

C. gracilis Planch. in Bull. Soc. Bot. Fr. 5, 494 (1858).

C. Jonthlaspi L. var. *microcarpa* Arcang. Comp. fl. Ital. 63 (1882).

Jonthlaspi microcarpum Caruel Fl. Ital. 9, 1051 (1893).

C. Jonthlaspi L. subsp. *microcarpa* Murb. Contr. fl. nord-ouest Afr. 1, 11 (1897).

C. Jonthlaspi L. subsp. *Gaudinii* Fiori var. *microcarpa* (Moris) Fiori in Flor. Ital. Exsicc. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. 17, 611 (1910).

C. Jonthlaspi L. var. *Morisiana* Reyn. in Bull. Géogr. Bot. 21, 291 (1911).

C. Jonthlaspi L. var. *Rouxiana* Reynier in Bull. Géogr. Bot. 21, 291 (1911) ; *C. Sarrati* De Laremborgue ex Reynier l.c. (probably a depauperated subvariation with scarcely any wing to the fruit).

var. 10, formula : w G d G L.

Distrib.—FRANCE : Cult. Mentone, *Moggridge* (4·5 mm.) ; nr. Lyon, *Jordan* (4 mm.).

DALMATIA : Lesina, *Alexander Prior* (3–4 mm.).

ASIA MINOR : Smyrna, *Fleischer* (4 mm.).

'IRAQ : Gorluk, *Chesney* 51 (3·5–4 mm.).

Synonyms.

C. Jonthlaspi L. var. *lejocarpa* Vis. Fl. Dalm. 3, 107 (1850), (or to var. 11).

C. psilocarpa Jord. et Fourr. Brev. Plant. Nov. 2, 14 (1868).

C. Jonthlaspi L. subsp. *macrocarpa* Fiori var. *psilocarpa* (Jord. et Fourr.) Fiori in Flor. ital exsicc. 1278 (1910) et in Nuov. Giorn. Bot. Ital. N.S. **17**, 610 (1910).

var. 11, formula : w G d G M.

Distrib.—BALEARICS : Majorca, Velldenose, *Edmonds* 164A, (3 mm.).

FRANCE : *Gonan* (3 mm.) ; nr. mouth of R. Adour, (2.5-2.75 mm.) ; nr. Toulon, *Bourgeau* 31 (3-3.25 mm.).

ITALY : Venice, nr. Brondolo, *Fiori and Béguinot* (3 mm.).

GREECE : Hymettus, *Heldreich* 823 (3 mm.).

MACEDONIA : N. of Salonika, Asbestochoroi, *Hill, Sandwith, Turill* 2659 (2.75 mm.).

ASIA MINOR : Lycia, Elmalu, *Bourgeau* (3 mm.).

Synonym.

C. Jonthlaspi L. var. *leiocarpa* Gruner in Bull. Soc. Imp. Nat. Mosc. **40**, pt. 2, 396 (1867). (or to var. 10).

var. 12, formula : w G d G S.

Distrib.—SPAIN : Murcia, Cehegin, *Gandoger* 372 (2.5 mm.).

GREECE : Corinth, *Atchley* 1625B. (2.5 mm.) ; Hymettus, *Heldreich* 823 (2.5 mm.).

Synonyms.

C. glabra Bois. in Ann. Sci. Nat. IIe Sér. **17**, 173 (1842).

C. laevigata Jord. et Fourr. Brev. Plant. Nov. **2**, 16 (1868).

Jonthlaspi clypeolatum Caruel var. *microcarpa* Caruel in Parlatore Flor. Ital. **9**, 1050 (1893).

C. microcarpa Moris var. *glabra* Hal. Consp. Fl. Graec. **1**, 117 (1900).

C. Jonthlaspi subsp. *Gaudinii* (Trachs.) Fiori var. *glabra* (Boiss.) Fiori in Flor. Ital. Exsicc. 1278 (1910) et Nuov. Giorn. Bot. Ital. N.S. **17**, 611 (1910) e descr. p.p. (and p.p. var. 11).

C. Jonthlaspi L. var. *glabra* (Boiss.) Reynier in Bull. Géogr. Bot. **21**, 290 (1911).

2. **C. elegans** Boiss. et Huet. in Boiss. Diagn. Ser. 2, V, 38 (1856).

An annual erect plant with slender much branched stems, about 2.8 dm. high. *Stems* terete, covered with closely adpressed, small, greyish white, stellate hairs, with rather long slender branches. *Leaves* linear to narrowly-oblongate, rarely broader, 3 mm. to 1.8 cm. long, 1.0-2.5 mm. broad, covered with stellate hairs, similar to or slightly more robust than those of the stem, on both surfaces, very dense on the lower, midrib (in dried material) slightly prominent

on lower surface of older leaves. *Inflorescence* in the young condition very compact lengthening with age, axis with similar indumentum to that of the stem, ebracteate, ebracteolate; flower pedicels 2.5 mm. to 3 mm. long. *Sepals* oblong-elliptic, apex rounded, with a membranous margin, 1.75 mm. long, stellate hairs on outside only, persistent in young fruit then caducous. *Petals* spatulate to oblanceolate, 2.5 mm. long, glabrous. The four longer *stamens* 2.75 mm. long, filaments asymmetrically flat-winged along the whole or the major part of their length, in the lower half on the adaxial side the wing much broader and ending in an erect tooth about 0.4 mm. long, entire and acute or slightly emarginate. The two shorter *stamens* 1.25 mm. long, with a membranous appendage, flattened dorsiventrally, 1 mm. long, apex slightly emarginate. *Gynoecium* 1.25 mm. broad, 2.5 mm. long including style 1 mm. long; ovary suborbicular-elliptic, compressed, biconvex, the central region with an indumentum of very short hairs, little longer than papillae, the margin transparent, inflated and convolute. *Fruit* nearly orbicular, 3.25–3.75 mm. long and 3.25–3.75 mm. broad, compressed and slightly biconvex, the margin inflated, convolute, and glabrous, the disc thickly covered with straight, slightly clavate, smooth hairs; fruiting pedicels 3.5 mm. long. *Seed* compressed ellipsoid, 1.5 mm. long, 1 mm. broad.

ARMENIA: in montibus inter Erzeroum et Ispir: inter Zarbos et Ibaho, 920–1230 m., June 1853, *Huet du Pavillon*.

var. *laevigata* Chaytor et Turrill: a planta typica fructu omnino laevi, margine leviter convoluta distinguitur.

“Asia Minor”: sine loc. *Zohrab*.

“Persia”: sine loc. Major Willoch (Herb. Cantab.).

3. *C. ciliata* Boiss. Fl. Or. 1, 309 (1867).

An annual erect plant with slender, slightly branching stems, 1.8–2.9 dm. high. A nearly vertical, relatively simple taproot. *Stems* terete covered with closely adpressed small greyish-white stellate hairs with numerous short dichotomous branches. *Leaves* linear to oblanceolate-linear, subacute to obtuse, 3 mm. to 1.3 cm. long, 1–2 mm. broad, covered with stellate hairs, having longer branches than those of the stem, on both surfaces, more dense on the lower; midrib (in dried material) slightly prominent on lower surface. *Inflorescence* in the young condition very compact, lengthening with age, axis with similar indumentum to that of the stem, ebracteate, ebracteolate; flower pedicels 1.5–2 mm. long. *Sepals* ovate-elliptic, 1.75 mm. long, with stellate hairs on the outside only, membranous margin, persistent in very young fruit then caducous. *Petals* oblanceolate, slightly bilobed, 2 mm. long, glabrous, persistent in young fruit, then caducous. The four longer *stamens* 1.75–2 mm. long, the filament flatwinged on the adaxial side in the lower half, the wing ending in a narrow, erect, acute tooth about 0.5 mm. long, the distal region of the filament enlarged papillate. The two shorter *stamens* 1 mm. long, the filament

enlarged and papillate in the distal region, bearing adaxially at the base a membranous appendage flattened dorsiventrally, nearly 1 mm. long. *Gynoecium* 2 mm. long including style 0.75 mm. long, ovary compressed, orbicular, 1.25 mm. diam., covered with short, simple hairs, longer, denser and more slender at the margin. *Fruit* sub-orbicular-elliptic, 4.5 mm. long, 3.75-4 mm. broad, compressed, slightly biconvex, covered over the whole surface with long, simple, straight, smooth or very slightly asprous hairs tapering to a point and particularly dense at the margins, mixed with short capitate hairs; fruiting pedicels up to 3 mm. long. *Seed* elliptic, compressed, 1.75 mm. long, 1.25 mm. broad.

LYCIA: in saxosis regionis subalpinae montis Elmalu, 13.5.1860, *E. Bourgeau* 30; Cragus Mtns., end of May, 1843, *E. Forbes* (see Spratt and Forbes: *Travels in Lycia* 2, 148, 161: 1847).

4. *C. eriocarpa* Cav. Descr. de las Plantas, 401, 615 (1802).

An annual erect plant with simple or slightly branched stems, 5.5 cm. to 2.6 dm. high. A nearly vertical, relatively simple taproot. *Stems* terete, simple, slightly, or much branched, slender, covered with closely adpressed, small, greyish-white stellate hairs having numerous long dichotomous branches. *Leaves* linear to linear-ob lanceolate, acute, narrowed below, 0.4 cm. to 1.7 cm. long, 1.0 mm. to 3.0 mm. broad, covered with compact much branched stellate hairs on both surfaces, very dense on the lower; midrib (in dried material) prominent below; in older plants as the fruit ripens most of the leaves drop off. *Inflorescence* in the young condition compact, lengthening with age, axis with similar indumentum to that of the stem, ebracteate, ebracteolate; flower pedicels 1.0-2.0 mm. long. *Sepals* elliptic, in young flower 2.75 mm. long, with stellate hairs on outside only, membranous margin, enlarging slightly in young fruit, persistent. *Petals* obovate-ob lanceolate, 3 mm. long, bearing stellate hairs on outside only, persistent. The four longer *stamens* 2 mm. long, the lower two-thirds of the filaments asymmetrically flat-winged, in the lower half on the adaxial side the wing much broader and produced into an erect, acute to acuminate tooth, about 0.25-0.5 mm. long; the two shorter *stamens* 1.5 mm. long, bearing adaxially a membranous appendage about 1 mm. long, flattened dorsiventrally, bearing one minute tooth near the apex. *Gynoecium* 2 mm. long including style 0.5 mm. long, ovary orbicular, covered with a dense white indumentum, probably of stellate hairs. *Fruit* compressed, slightly biconvex, orbicular, 5.5-6 mm. broad, margin crenulate, densely covered with a white indumentum of very long fine hairs; these may be the lengthened arms of stellate hairs; fruiting pedicels up to 4 mm. long. *Seed* orbicular, compressed, biconvex, 1.5 mm. broad.

SPAIN: Castile: in collibus calcareis ad Aranjuez, 20.5.51, *J. Lange* in F. Schultz, *Herb. norm.* 213; Aranjuez, 5.1852, *Boissier*; in coll. prope Aranjuez, April, *Herb. Graelsianum*; Cerro de Aran-

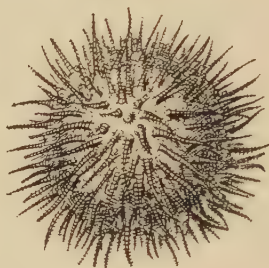
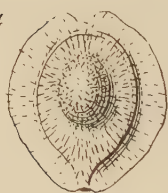
eriocarpa*elegans**elegans* var. *laevigata**ciliata**aspera**lappacea**cyclodonteia**dichotoma**var. 2b**var. 3a**var. 2a*

Fig. 2. Fruits of species of *Clypeola* $\times 6\frac{2}{3}$. Top row—right hand figure (*C. elegans*) var. *laevigata*), shows fruit with style removed. Bottom row—fruits of *C. Jonthlaspi* variations.

juez, dans les paturages de *Stipa tenacissima*, 7.5.1854, E. Bourgeau 2092.

Granada : coteau arides a Cullar entre Baza et Huescar ou il croit en abondance avec le *Stipa tenacissima*, 26.5.1851, E. Bourgeau 1023.

Prov. d'Almeria : coteaux arides à Cullar entre Baza et Huescar, 26.5.1852, E. Bourgeau.

Synonyms.

Vesicaria lanuginosa Poir. in Lam. Encycl. **8**, 573 (1808).

Alyssum lanuginosum Pourret ex Poir. l.c.

Alyssum eriophorum Pourret in Willd. Enum. 671 (1809).

Orium lanuginosum Desv. Journ. Bot. **3**, 162 (1814).

Alyssum eriocarpum Poir. apud Desv. l.c.

Clypeola eriophora DC. Syst. **2**, 327 (1821).

Alyssum eriocarpum Pourr. ex Steud. Nomencl. ed. 2, 67 (1840)

Clypeola eriocarpha Cav. ex Lag. in litt. sec. Del Amo, Flor. Fanerog. Esp. y Port. **6**, 57 (1873).

Cavanilles in his Descr. de las Plantas 401, 615 (1802), does not appear to use a binomial for this species. His Latin reference to the plant is: "911. CLYPEOLA eriocarpha foliis sublinearibus incanis: siliculis lanatis." Apparently he always ran on from the name to the diagnosis without a stop.

5. *C. aspera* (Grauer) Turrill in Journ. Bot. **60**, 269 (1922).

An annual erect plant with simple to much branched stems, 3 cm. to 2.1 dm. high. A nearly vertical almost simple taproot. Stems terete, covered with closely adpressed, small, greyish-white, long-branched stellate hairs. Leaves linear, spatulate to narrowly oblanceolate, acute, 3.0-0.4 cm. long, 3.5 to 1.0 mm. broad, covered on both surfaces with stellate hairs, more dense on the lower, the comparatively few, stellately arranged branches of the hairs dichotomously branched; midrib (in dried material) prominent on the lower surface; in older plants, as the fruits ripen, most of the leaves fall off. Inflorescence compact in the young condition, lengthening with age, axis with similar indumentum to that of the stem, ebracteate, ebracteolate; flower pedicels 1 mm. long. Sepals elliptic to elliptic-ovate, 2 mm. long, with stellate hairs on the outside only, membranous margin, persistent in very young fruit, then caducous. Petals spatulate, rounded to slightly emarginate, 2.5 mm. long, persistent in very young fruit then caducous, quite glabrous. The four longer stamens 2 mm. long, filaments asymmetrically flat winged, in the lower half on the adaxial side the wing much broader, ending in an erect acuminate tooth about 0.5 mm. long; the two shorter stamens 1.5 mm. long, bearing adaxially on the lower half of the filament a membranous appendage flattened dorsiventrally, more or less entire and sharply acute or with two erect acute teeth about 0.25 mm. long. Gynoecium 1.5 mm. long including style 0.5 mm. long; ovary suborbicular, compressed, covered with simple

rather broad capitate hairs which later lengthen and become barbed. *Fruit* compressed, slightly biconvex, ovate-orbicular, 3.5 mm. long, 3 mm. diam., with an irregularly crenulate margin, with 2 kinds of hairs, long hairs barbulate-capitulate and with short reversed barbs throughout their length, short hairs barbulate-capitulate; fruiting pedicels up to 3.5 mm. long, more or less curved (arched) downwards. *Seed* elliptic-orbicular, compressed, biconvex, 1.8 mm. long, 1.6 mm. broad.

TURKEY : in gramin. Nimrud Dagħ supra Orfa, 4.1867, *Hausknecht*.

SYRIA : Djebel Khairoun, nord de Damascus, 24.3.1876, *Gailardet* 1567.

PALESTINE : Tufila, *Roth* ; 3 hrs. S.E. of Es Salt, 830 m., 29.4.1911, forest, *Myers et Dinsmore* M.572.

IRAQ : Kurdistan, *Olguin* ; Mesopotamia, *Aucher-Eloy* 283 ; in desertis ad Kerkuk, c. 400 m., 26.4.1893, *Bornmüller* 898 ; near Chamchewal, 770 m., 6.4.1929, *F. A. Rogers* 0179A.

PERSIA : in glareosis faucium pr. Gere inter Abuschir et Schiras, 17.3.1842, *Kotschy* 63 ; pr. Sser-tschah, 3.1859, *Bunge* ; in gramin. Kaserun, 4.1868, *Hausknecht* ; unter d. ephemeren Vegetation d. Gypshügel v. Komaredsch, N. Seite, 4.5.85, *Stapf* ; inter prov. Kerman : in collibus regionis calidae prope Kerman, c. 2000 m., 2.5.1892, *Bornmüller* 2193 ; Dehaneh Baghi, 26.4.1908, *W. E. James*.

BALUCHISTAN : Dorbund, 1851, *Stocks* 879 ; Quetta, 7.4.1888, *Duthie* 8601 ; Surkhab Valley, 1800 m., 28.4.1889, *Lace* 3734.

AFGHANISTAN : Chokey, *Griffith* 1514.

Synonyms.

Peltaria aspera Grauer, *Decuria* 6 (1784). This is based on *Jonthlaspi orientale fructu echinato* Tourn. Coroll. 14. Grauer's description is republished by Sprague in *Journ. Bot.* **60**, 269 (1922).

Clypeola lasiocarpa Juss. ex Pers. Syn. **2**, 193 (1805-07).

Bergeretia echinata Desv. *Journ. Bot.* **3**, 162 t. 25, f. 9 (1814).

C. echinata DC. Syst. **2**, 328 (1821) et Prodr. **1**, 165 (1824).

C. chaetocarpa Jaub. et Spach, Ill. Pl. Or. **3**, t. 206 (1847-50).

6. *C. lappacea* Boiss. in Ann. Sci. Nat. sér. II. **17**, 174 (1842).

An annual erect plant with simple to much-branched stems, 4 cm. to 1.7 dm. high. A nearly vertical slightly branched tap-root. *Stems* terete, covered with closely adpressed small greyish-white, comparatively few-rayed, stellate hairs. *Leaves* long narrow oblanceolate to spatulate, acute to subacute, 4 mm. to 3 cm. long, 1 to 7 mm. broad, covered on both surfaces with stellate hairs similar to those of the stem, rather more dense on the lower ; midrib (in dried material) prominent on the lower surface, often forming a furrow on the upper ; in older plants as the fruit ripens, all the leaves fall off. *Inflorescence* compact in young condition, lengthening

with age, axis with similar indumentum to that of the stem, ebracteate, ebracteolate; flower pedicels 2 mm. to 3 mm. long. *Sepals* elliptic-ovate, 2.5 mm. long, membranous margin, stellate hairs on outer surface only, elongating to 3 mm. in young fruit, then caducous. *Petals* spathulate-oblongate, 3.75 mm. long, elongating to 4 mm. in young fruit, then caducous, glabrous. The four longer *stamens* 3 mm. long, filaments asymmetrically flat-winged, in the lower half on the adaxial side the wing much broader, ending in an erect acute tooth, 0.5–0.75 mm. long and very narrow or somewhat broader. The two shorter *stamens* 2 mm. long, asymmetrically flat winged as in the four larger, the tooth of the adaxial wing very narrow, acute, about 0.75 mm. long. *Gynoeceium* 2.5 mm. long including style 1.5 mm. long; ovary elliptic, compressed, covered with a dense indumentum of short, stout, simple hairs. *Fruit* ovate-orbicular, compressed, biconvex, 5 mm. long, 4.5 mm. broad, pericarp coriaceous, margin not membranaceous, entire in the lower part with a few coarse teeth in the upper, covered with stiff bristles barbate-capitulate and with short reversed barbs throughout their length, in addition there are short hairs once or twice dichotomously forked at the apex, each fork finally ending in a sharp point; fruiting pedicels up to 4.5 mm. long, abruptly turned downwards, not curved. *Seed* nearly orbicular, 3 mm. diam.

SYRIA: sine loc. 1846, *Pinard*; Antilibanus, supra Rascheya, 6.1846, *E. Boissier*.

ARMENIA TURCICA: Kharput, Mezre, 8.5.1889, *P. Sintensis* 319.

TURKEY: Mardin, 1836, *Aucher-Eloy* 282; in gramin. pr. Mardin, 3.1867, *C. Haussknecht*.

IRAQ: in gramin. Djebel Taktak, 4.1867, *C. Haussknecht*.

PERSIA: inter Teheran et Tabris, 6.1859, *Bunge*; Urmia district, 5.1926, *B. Gilliat-Smith* 1565.

Synonym.

C. lasiocarpa Jaub. et Spach, Ill. Pl. Or. 3, t. 205 (1847-50) non Juss. [ex Pers. Syn. 2, 193 (1805-07) = *C. aspera*].

7. ***C. Raddeana*** *Alb.* in Bull. Herb. Boiss. 2, 448 (1894) et Bush in Flor. Cauc. Crit., Cruciferae, 615 (1910).

This species, of which we have seen no material, is apparently characterized especially by the absence of any wing to the silicules. It is recorded from "in aridis, saxosis siccis, decliv. siccis, lapidosis, detritu mobili Transcaucasiae occidentalis, in prov. Batum, distr. Artwin" (Bush, l.c.). The original description of Alboff's reads:

"*Pumila tenuis gracilis, caule bifurco, siliculis orbiculatis emarginatis, stylo longiusculo (emarginatura majore) superatis; disco tuberculato margine viridi incrassato ala destituto. Adjarie: Artwin (Dr. Radde 1893. Exs. N.493).*" The description given by Bush (l.c.) is rather more detailed and reads: "*C. Raddeana*

Alb. gracilis, caule tenui, ramoso 11-36 cm. alto ; foliis oblongo-spathulatis, obtusis. *Sepalis* $1\frac{1}{4}$ - $1\frac{1}{2}$ mm. longis ; petalis 2 mm. longis. *Pedunculis fructiferis* patentibus v. reflexis, *tenuissimis* 3-4 $\frac{1}{2}$ mm. longis ; *siliculis suborbiculatis*, emarginatis, ca. 2 $\frac{1}{2}$ mm. longis, ca. 2 mm. latis, *disco tuberculato, margine viridi glabro incrassato, ala destituto* ; stylo 0.2-0.6 mm. longo, emarginaturam siliculæ superante. ☉ v.s. in h. Th. Tm.

8. **C. cyclodonte** *Delile* in Bull. Soc. Agr. Hérault, 1830, 258.

An annual erect plant with simple to much branched stems, 3 cm. to 2.7 dm. high. A nearly vertical relatively simple taproot. *Stems* terete, covered with closely adpressed, small, greyish-white stellate hairs. *Leaves* spathulate-linear, oblanceolate to oblanceolate-elliptic, acute to subacute, narrowed below, 0.3 to 3.5 cm. long, 1.5 to 6 mm. broad, covered with stellate hairs on both surfaces, very dense on the lower, the stellately arranged branches of the hairs dichotomously branched ; midrib (in dried material) prominent both above and below ; in older plants as the fruits ripen most of the leaves fall off. *Inflorescence* in the young condition very compact, lengthening with age, axis with similar indumentum to that of the stem, ebracteate, ebracteolate ; flower pedicels 1-1.5 mm. long. *Sepals* elliptic, in young flower 2.25 mm. long, with stellate hairs on the outside only, apices cucullate, with a membranous margin, enlarging in very young fruit to 2.5 mm. long and then caducous. *Petals* spathulate-oblanceolate, 2.5-2.75 mm. long, with a few stellate hairs on the outside only. The four longer *stamens* 2 mm. long, filaments asymmetrically flat-winged, in the lower half on the adaxial side the wing much broader and ending in an erect acute tooth about 0.3 mm. long ; the two shorter *stamens* 1.75 mm. long with a membranous appendage arising from near the base and flattened dorsiventrally. *Gynoeceum* 1.75 mm. long including a very short style ; ovary suborbicular, compressed, covered with a dense stellate indumentum, the margin early becoming crenulate. *Fruit* orbicular, up to 9 mm. diam., with a deeply notched margin covered with two distinct kinds of hairs, the one kind stellate and short, the other longer, hooked and spreading ; fruiting pedicels up to 4 mm. long ; straight, deflexed and forming on an average an angle of about 45° with the rhachis. *Seed* orbicular, compressed, 2.5 mm. diam.

S. FRANCE : Port Juvenal, 1831 and 1833, *Delile* (alien).

ALGERIA : lieux arides entre les touffes d'alfa pres de Timetlas sur les Hauts-plateaux, cercle de Saida 23.5.52 *Balansa* 537 et 25.5.1852, *E. Cosson* ; Gharrouban, Tlemcen, en face de la maison Diaz, 5.1855, Munby ; plaines cultivées a Batna, 4.5.1856, *Henon et Lefranc* 105 ; environs de Djelfa, 4.1857, *Reboud* 105 bis ; province de Constantine, 27.3.58, *E. Cosson* ; Gélyville, in collibus, 25.3.67, *A. Warion* ; fentes des rochers a le May (Sahara oranais) 5.5.1868, *A. Warion* ; in vervactis, ad margines agrorum circa Sidi-Bel-Abbès, prov. Oran, 21.4.1874, *A. Warion*.

9. **C. dichotoma** Boiss. in Ann. Sci. Nat. Sér. II. 17, 175 (1842).

An annual erect plant with much branched stems, 2 cm. to 1·2 dm. high. Habit very characteristic, with usually numerous widely spreading branches, of which the lower are longer and give a corymbose appearance to the whole plant, or simple below, much branched above forming a compact cluster. A nearly vertical relatively simple taproot. *Stems* terete, covered with small, closely adpressed, greyish white, stellate hairs whose numerous slender branches are dichotomously branched. *Leaves* more or less opposite, broadly elliptic or obovate to spatulate-oblongate, subacute to obtuse, older leaves more or less narrowed below into short petiole, 4 mm. to 1·1 cm. long, 1·5 mm. to 1·1 cm. broad, more or less densely covered with stellate hairs on both surfaces, more dense on the lower; in dried material, midrib and two to four lateral veins, arising near the base, prominent on lower surface; leaves crowded at periphery of plant, absent from older parts. *Inflorescence* a comparatively lax spike lengthening slightly with age, axis with similar indumentum to that of the stem, situated at apex of stem exposing the flowers, subsequently hidden by upward growth of lateral branches arising near base of axis, ebracteate, ebracteolate, flower pedicels 1·2 mm. long. *Sepals* few stellate hairs on outside only, the two outer obovate, rounded cucullate, 1·5 mm. long, 1·25 mm. broad, the two inner oblong-oblongate, obtuse, 1·75 mm. long, 0·75 mm. broad, caducous in young fruit. *Petals* spatulate oblong to linear, 1·75 mm. long, 0·6 mm. broad, glabrous, caducous in young fruit. The four longer stamens 1·1-1·4 mm. long, filaments asymmetrically flat-winged, in the lower half on the adaxial side the wing much broader, ending in an erect subacute tooth, less than 0·5 mm. long; the two shorter stamens 1·1-1·2 mm. long, bearing adaxially on the lower half of the filament a membranous appendage flattened dorsiventrally, entire and subacute, 0·6 mm. long. *Gynoecium* 1·5 mm. long including more or less capitate stigma and style 1 mm. long; ovary compressed-ovoid, apparently glabrous. *Fruit* forming infructescences overtopped by younger branches, biconvex, elliptic-ovate in outline, 3-3·5 mm. long, 2-2·75 mm. broad, margin entire, covered with spreading clavate asprous hairs; fruiting pedicels about 4 mm. long. *Seed* elliptic-ovate, compressed, biconvex, 1·75 mm. long, 1·4 mm. broad.

ARMENIA: Szovits 281 in Herb. Kew.; according to Boissier (Flor. Or. 1, 310; 1867) Szovits's material was collected "in aridis salsis Armeniae ad Nackitchewan et Schabauli"; prov. Erivan, prope Nachitshevan, in collibus siccis, 11.5.1923, *Grossheim* 65.

PERSIA: Azerbaidjan, *Aucher-Eloy* 4082; inter Jesd et Isfahan, Maj. 1859, *Bunge*; Mähron, prov. Hamadan, 12.5.1884, *Pichler*; Zendgre in apricis, 21.5.1884, *J. A. Knapp*; Khoi in lapidosis, 27.5.1884, *J. A. Knapp*.

AFGHANISTAN: Hari-rud valley, 19, 27.4.1885, *Aitchison* 1155.

Synonym.

C. minima Stapf in Denkschr. Acad. Wien **51**, 303 (1886)—a depauperated form.

DISCUSSION.

The taxonomic units which we have here regarded as species are morphologically clearly separable one from another. Boissier (Fl. Or. **1**, 308 seq.: 1867) classifies the Oriental species accepted by him under three sections: 1. *Jonthlaspi* DC. (*C. Jonthlaspi*, *C. microcarpa*, *C. elegans*, *C. ciliata*), 2. *Bergeretia* DC. (*C. echinata*, *C. lappacea*), 3. *Pseudoanastatica* (*C. dichotoma*). This classification undoubtedly serves to emphasize the facts that *C. dichotoma* is markedly distinct in its peculiar habit of growth from the other species, that *C. echinata* and *C. lappacea* are closely related, and that *C. elegans* is more closely related to *C. Jonthlaspi* (in which we include *C. microcarpa*) than it is to any other species.

The species other than *C. Jonthlaspi* may first be considered.

C. elegans has apparently a very limited distribution in Armenia (and perhaps neighbouring areas). Its peculiar inflated convolute margin distinguishes it from all the variations of *C. Jonthlaspi*. It is, however, very interesting to note that a parallel variation with *C. Jonthlaspi* occurs in fruit indumentum. *C. elegans typica* would compare with *C. Jonthlaspi* var. 7 (of which, however, no material has been seen) or var. 8. *C. elegans* var. *laevigata* parallels *C. Jonthlaspi* var. 10 or var. 11. *C. ciliata* is only known from Lycia. Its fruits are covered over the whole surface with a mixture of two kinds of hairs.

C. eriocarpa is endemic in Spain. Its silicules up to 6 mm. diam. are exceeded in size only by those of *C. cyclodonteia*.

C. aspera and *C. lappacea* are rather closely related morphologically and their geographical distribution overlaps rather considerably. Both occur over a fairly wide area in the Orient. A number of differential characters appear, however, to be constantly correlated—the size of the flower, the length of the styles, and the angle of the fruiting pedicels. We have, therefore, thought it advisable to keep them distinct.

No material of *C. Raddeana* has been available for study. The published descriptions are somewhat meagre and the species remains doubtful. It is, *e descriptione*, especially characterized by the absence of a wing to the silicules and a tubercled disc. It is only known from the Batum district of Transcaucasia.

C. cyclodonteia is a North African species which was originally described as an alien from Port Juvenal, near Montpellier. This species has larger fruits than any other member of the genus.

C. dichotoma has a distribution extending from Armenia through Persia to Afghanistan. The species shows a wide range in size, probably depending mainly on the most local habitat conditions.

When well developed the plants have a peculiar habit owing to the relatively considerable branching with the branches widely spreading. The infructescences are overtopped by the growth of younger branches and the fruits ripen relatively low down amongst the branches. In addition very small depauperated forms occur (*C. minima* Stapf).

It is certain that the species as accepted above are relatively clear-cut morphologically—decidedly more so than are the variations we place under *C. Jonthlaspi*. There is no evidence of their crossing together or with *C. Jonthlaspi* even when distributional areas overlap.

The most difficult species taxonomically, but the most interesting, is *C. Jonthlaspi* which is by far the most polymorphic and has the widest geographical range. Most of what we have considered variants within the one species have by one or more authors been given binomials. Our reasons for considering them as variants of *C. Jonthlaspi* rather than as distinct species are :

1. The morphological characters recorded in our formulae are the best diagnostic ones we could find but they not infrequently show intermediate degrees of development. This is particularly true as regards size of fruit. The limitations of the three groups of classes based on fruit size (L, M, S) are largely arbitrary in the sense that a series of specimens showing almost continuous gradation in fruit size could be selected. Intermediate states of indumentum development also occur.

2. The morphological characters formulated occur in all possible 12 combinations (except that var. 7, w G d H L, has not been seen). This strongly suggests the interaction of a number of Mendelian factors differently combined as a result, partly, at least, of some hybridization and segregation.

3. On the whole the variants show no isolation. In geographical distribution there is general overlapping and often a wide distribution more or less throughout the species area. Apparent discontinuity in distribution of any given variant may be due merely to insufficient collecting in intermediate areas. Ecologically the variants grow under similar conditions and at similar altitudes. Indeed, field studies in South Macedonia have shown that several variants frequently grow in mixed populations. The mixed collections frequently seen in herbaria point to the common and widespread occurrence of similar mixed populations.

Two variants require special mention. Var. 9 [var. *microcarpa* (Moris) Arcang. s.s.] is the most distinct and uniform in the expression of its formulated characters of all the variants. Not only is the indumentum of the fruit (w G d H) developed in a very constant degree, the wings quite glabrous, and the disc covered with dense short white hairs, but the fruit shape and size show small ranges.

Under var. 3 (with the general formula w H d H S) we have placed specimens, from the Gavarnie district, French Pyrenees,

which have been named *C. pyrenaica*. They are samples of what the available evidence indicates is a very isolated population. The specimens are morphologically similar in having very small fruits but there is some variation in indumentum development and technically some individuals should be placed under var. 9 (w G d H S), but they have not the dense white disc indumentum of all our quoted specimens of this variant.

It would seem that within *C. Jonthlaspi*, as here accepted, we have a polymorphic species, consisting of a large number of variants. These are partly combinations of characters having more or less simple genic bases. Probably self-pollination is common, if not the rule, but crossing between variants no doubt occurs at times. It is hoped to test these matters experimentally in the near future. It is suggested that at least three gene pairs are necessary to explain the indumentum characters of the fruit. Fruit size (usually showing a high degree of correlation with plant size) is also dependent to a certain extent on genetic constitution. Possibly a number of multiple allelomorphs are concerned some of which may also slightly modify fruit shape.

On the other hand, the var. 9 with its very clear cut expression of fruit characters is at least an incipient morphological species. Similarly the Gavarnie population (under var. 3) indicates a possible stage in the reduction and divergence of variation of an isolated portion of a species population and may represent a species in the making.

In attempting to place published names under one or other of our accepted variants of *C. Jonthlaspi* we have done the best we could with imperfect descriptions most of which have no definitely cited type associated with them. It is impossible to be quite certain of the correct placing of several of the synonyms.

II.—STUDIES IN THE ERICALES: I. NEW AND LESS-KNOWN SPECIES OF AGAPETES. H. K. AIRY-SHAW.

The most important contribution to our knowledge of *Agapetes* since the account by C. B. Clarke in the Flora of British India, 3 (1881-82), is the paper by W. E. Evans in the Notes from the Royal Botanic Gardens, Edinburgh, 15, 199-208, tt. ccxix ccxxi (1927). This paper was based principally upon the copious material collected by the late George Forrest. It is the purpose of the present paper to elucidate in a similar manner the material brought back by Capt. F. Kingdon Ward from Upper Burma and Assam in the course of the last decade, which has contained a remarkable number of new and interesting species of *Agapetes* and allied genera. Descriptions of or notes on certain other new or misunderstood species have been included, principally from the material in the Kew Herbarium, where all the specimens cited are preserved unless otherwise stated.

The separation of the genus *Agapetes* from *Vaccinium* Sect. *Epigynium* is probably an artificial one, but for practical purposes it is here maintained, pending a revision of the entire *Vaccinioideae*. The genus, such as it is, may be divided into three main groups, which do not appear to merit higher rank than that of Series. These groups, which are probably natural, are not susceptible of concise definition: for the practical work of identification, therefore, the artificial arrangements of C. B. Clarke and of Brandis may be found of greater use. As so often happens, a "natural" (or phylogenetic) arrangement, according to probable lines of descent, is incompatible with a "practical" arrangement by means of single, easily observed characters. It is the difference between "vertical" and "horizontal" classification: the latter is often more useful for practical purposes, but the former of greater value from a theoretical standpoint.

The following is an attempt at a diagnosis of the three series.

Series i. **Robustae** *Airy-Shaw*, ser. nov. Caules ramique plus minus robusti et rigidi; folia inter maiora, saepe ampla, saepe pseudo-verticillata; inflorescentiae racemosae, corymbosae vel fasciculatae; filamenta brevissima.—Typus, *A. setigera* D. Don.

Series ii. **Graciles** *Airy-Shaw*, ser. nov. Caules ramique plus minus graciles et flexuosi, saepe scandentes; folia nunquam pseudo-verticillata, saepe angusta vel inter minora, saepe discoloria; inflorescentiae corymbosae, rarissime fasciculatae, pedunculo saepe elongato; filamenta brevissima; antherae dorso ecalcaratae.—Typus, *A. linearifolia* C. B. Clarke.

Series iii. **Longifiles** *Airy-Shaw*, ser. nov. Caules ramique inter graciliores, sed raro scandentes; folia plerumque parva, rarius inter maiora; inflorescentiae plerumque fasciculatae, saepe uniflorae, raro racemosae vel corymbosae; filamenta elongata, antheris longiora vel saltem iis aequilonga, rarissime breviora.—Typus, *A. Kanjilali* A. Das.

Series i is represented in the "Flora of British India" by Clarke's Sections I and II, as well as species 19 and 20 of Sect. IV, and species 24 (Sect. V). I consider that there are insufficient grounds, in view of the polymorphism of *Agapetes*, for maintaining *A. acuminata* (Wall.) D. Don as a distinct genus (*Corallobotrys* Hook. fil.); it should be included in Series *Robustae* as a *species anomala*. I have not attempted to construct a key to this Series, as it still requires much critical study.

Series ii includes species 18 (Sect. III) and 25 and 26 ("imperfectly known") of the "Flora of British India"; the genus *Desmogyne* King et Prain; and five other species, including two described here as new. The group is found in the mountains surrounding the Brahmaputra valley in north-eastern Assam, *i.e.*, the Daphlas, Abors, Mishmis, and Patkois, extending also eastwards into western Yunnan and southwards at least to Bhamo in Upper

Burma. No species are known from the Khasia Hills or from Lower Burma. A key to all the species referred to this group will be found on p. 38, *infra*.

Series iii includes, from the "Flora of British India," species 16 and 17 (Sect. III) and 21 and 22 (Sect. IV). Also referable here is *Agapetes Pottingeri* Prain, the type of the same author's Sect. *Holocalyx*. In addition to several species published since the "Flora of British India," four are described here for the first time. The outstanding characteristic of the species of this group is the elongation of the filaments: only in *A. bracteata* Hook. fil. (and the anomalous *A. pilifera* Hook. fil. and *A. obovata* (Wight) Hook. fil.) are they almost as short as in the majority of the genus. In all except *A. bracteata*, *A. Pottingeri*, and *A. adenobotrys* Airy-Shaw the peduncle of the inflorescence is completely suppressed. A key to the group is supplied on p. 44, *infra*.

I have decided to include the very anomalous *A. pilifera* and *A. obovata* in this Series, as *species anomalae*, rather than establish separate series for their reception, only after much deliberation and hesitation. *A. pilifera* appears to be related to *A. bracteata* Hook. fil. and possibly even to *Vaccinium Dunalianum* Wight, whilst *A. obovata* has probably arisen from the same stock as *A. Mannii* Hemsl.

All species of *Agapetes* described since the "Flora of British India" and not enumerated in the keys to Series ii or iii (*infra*) are referable to Series i, with the exception of *A. manipurensis* Watt ex Brandis (Ind. Trees, 405: 1906), *A. parviflora* Dunn and *A. vaccinioides** Dunn: these are all species of *Vaccinium*, the first-named being allied to *V. retusum* (Griff.) Hook. fil. ex C. B. Cl., while the last two are near *V. Dunalianum* Wight and *V. arbutoïdes* C. B. Cl. Closely allied to the latter also are the four species from the Malay Peninsula referred to *Agapetes* by Ridley (Fl. Mal. Penins. 2, 205: 1923; 5, 318: 1925). All other species from the Malay Islands and from Australia are referable either to *Vaccinium* or to *Dimorphophanthera*.

Series i. ROBUSTAE.

Agapetes macrophylla C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 445 (1881); Brandis, Ind. Trees, 404 (1906).

ASSAM. Chibaon, Delei valley, 28° 10' N., 96° 30' E., 1800 m., 8 Apr. 1928, F. Kingdon Ward 8032: "A small or straggling epiphytic shrub of the temperate rain-forest. Remarkable for the large size of the leaves. The flowers are borne on pendent bunches from the old wood. Corolla green with zig-zag crimson markings, translucent. Calyx and ovary bright red."

* *A. vaccinoïdea* Lévl., which antedates Dunn's species by about six months, is referred by Rehder (in Journ. Arn. Arb. 15, 288: 1934) to *Vaccinium japonicum* var. *sinicum* (Nakai) Rehd.

A magnificent species, hitherto known only from the type-specimens collected by Griffith in the Khasia hills. The leaves, easily the largest in the genus, in Kingdon Ward's specimens are rounded to truncate or very slightly cordate at the base, and measure up to 30 cm. in length and 13.5 cm. in width. The calyx-teeth are somewhat shorter and broader than in the type. The specimens agree, however, so well in all main characters that there seems no justification for separating them even varietally on present evidence.

Agapetes burmanica W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15**, 199, t. ccxix (1927).

ASSAM. Delei valley, 28° 17' N., 96° 35' E., 900–1200 m., 23 Apr. 1928, F. Kingdon Ward 8124: "A big straggling shrub with long loose branches, forming confused tanglements on a precipitous wooded cliff; rarely more or less erect and then probably soon flopping over. Not epiphytic. Flowers pendent singly or in bunches from the old wood, sometimes from the extreme base of the stem, so that they touch the ground. Corolla 2–2½ in. long, bright rose-crimson for $\frac{3}{4}$ of its length with darker veining, apple-green towards the apex, including the long narrow teeth, which curve outwards, and barred with crimson."

As pointed out by Evans (*l.c.* 200), this species resembles *A. grandiflora* Hook. f. in floral characters and *A. auriculata* (Griff.) Hook. f. in foliage, differing from both in the large calyx-segments. In this latter character, however, it agrees with *A. sikkimensis* Airy-Shaw (described below, p. 29), which is undoubtedly a close ally of *A. auriculata*. *A. burmanica* thus forms a link between these species and *A. grandiflora*.

The following species of this series are all distinguished by elongate calyx-segments, but it would be unsafe to conclude, on the basis of this one character alone, that they are all necessarily closely related: *A. miniata* (Griff.) Hook. f.; *A. macrophylla* C. B. Cl.; *A. sikkimensis* Airy-Shaw; *A. burmanica* W. E. Evans; *A. megacarpa* W. W. Sm.; *A. Hillii* Brandis (Ind. Trees, 404: 1906; type, *Montague Hill* 112, in Herb. Kew.); *A. marginata* Dunn. Compare also *A. setigera* var. *macrosepala* Airy-Shaw (p. 34, *infra*).

Agapetes pubiflora Airy-Shaw, sp. nov. habitu *A. macrophyllae* C. B. Cl. subsimilis, sed foliis nervo marginali distinctissimo praeditis, venulis valde obscuris nec pulchre reticulatis, corymbis puberulis brevissime pedunculatis, calycis segmentis breviter deltoideis acuminatis, antheris dorso calcaratis abunde discrepat; *A. glabrae* (Griff.) C. B. Cl. et *A. sikkimensi* Airy-Shaw, pariter floribus puberulis gaudentibus, revera affinis, a priore corymbo brevissime pedunculato, a posteriore calycis segmentis breviter deltoideis, ab utraque foliis haud pseudo-verticillatis amplioribus basi in petiolum brevem angustatis, corolla dimidio longiore, antheris dorso

calcaratis, stigmatē parvo itaque corollae lobis apice haud cucullatis bene distincta.

Frutex epiphyticus, ramis robustis usque 8 mm. diametro leviter anfractuosus obtuse grosse angulatus glabris laevibus. *Folia* alterna, haud verticillata, ut videtur plus minus disticha, ampla, ovato-oblonga usque obovato-oblonga, rarius ovata vel elliptica, 13·5–22·5 cm. longa, 6–10 cm. lata, basi cuneata usque subrotundata, apice breviter vel brevissime acuminata, acuta, margine remote undulato-crenata, dentibus obscuris hydathodiiformibus vix prominulis saepe indentatis, glandula vel hydathodio ima basi laminae utrinque singulo conspicuo, sat coriacea, glaberrima, costa valida infra prominente basi 3–4 mm. crassa, nervis lateralibus utrinque 15–25 adscendentibus fere rectis parallelis subtus elevatis cum nervo conspicuo marginali tandem anastomosantibus, venulis plerumque obscuris; petiolus crassus, fuscus, 5–10 mm. longus. *Corymbi* e ramis vetustioribus orti, subfasciculiformes, toti puberuli: pedunculi abbreviati, usque 1 cm. longi, singuli vel nonnunquam bini ut videtur ex eadem axilla, basi perulis parvis triangularibus fimbriatis suffulti, bracteis pedicellos suffulcientibus lanceolatis 3–4 mm. longis plerisque delapsis; pedicelli 1·8–2·5 cm. longi, subcarnosi, sursum incrassati, cupula apicali vix evoluta, ima basi bracteolis 2 plus minus persistentibus bracteis similibus sed minoribus instructi. *Calyx* totus 5–6 mm. longus: receptaculum basi truncatum, 2 mm. longum; calycis limbus 3–4 mm. longus; segmenta ovato-triangularia, breviter acuminata, acuta, carinata, basi breviter connata. *Corolla* subcylindrica, basin versus levissime angustata, circiter 2·8 cm. longa (inclusis segmentis triangularibus 4 mm. longis acuminatis acutis apice reflexis), basi 4 mm. usque fauce 8 mm. diametro, quam pedicellus et calyx subtilius densiusque puberula, subcarinato-pentagona. *Stamina* tota circiter 2·8 cm. longa: filamenta applanata, 3 mm. longa, superne subsericeo-pubescentia; antherae 2·6 cm. longae, parte pollinifera scabridopapillosa ipsa basi breviter obtuse uncinato-incurva et fere verruculoso-scabra, rostris omnium antherarum conniventibus et leviter cohaerentibus, cuiusque antherae omnino connatis laevibus, antherarum alternarum circiter 9 mm. et 11 mm. infra apicem bicalcaratis, calcaribus circiter 1·5 mm. longis alternatim aut ambabus deflexis rostro arcte adpressis aut altera descendente recta altera adscendente recurva. *Stylus* gracilis, glaber, circiter 2·8 cm. longus, stigmatē parvo vix expanso. *Fructus* ignotus.

UPPER BURMA. Valley of the Nam Tamai, 900 m., 10 Jan. 1931, *F. Kingdon Ward* 9118 (type, Herb. Mus. Brit.): "One of the commonest epiphytic species hereabouts; present on almost every big tree, flowering freely. Flowers crimson with green teeth."

S. E. TIBET. Lat. 28° 25' N., long. 97° 55' E., 1200–1500 m., 22 Nov. 1931, *F. Kingdon Ward* 10,168 (Herb. Mus. Brit.): "A common epiphytic shrub, now in full bloom in the forest. Especially abundant along the rocky bank of the river."

Evidently allied to the *auriculata-glabra-sikkimensis* group, but very distinct in its petiolate, non-verticillate leaves, larger corolla and spurred anthers.

Agapetes sikkimensis *Airy-Shaw*, sp. nov. *A. auriculatae* (Griff.) Hook. fil. peraffinis, quoad folia vix ab ea distinguenda, sed inflorescentiis subsessilibus pubescentibus e ramis vetustioribus ortis, calycis segmentis subduplo longioribus latioribusque basi contiguis sinubus acutissimis nec rotundato-truncatis seiunctis, fructibus subduplo maioribus satis recedit.

Agapetes auriculata C. B. Cl. in Hook. fil. Fl. Brit. Ind. **3**, 444 (1881), *pro parte*, quoad specimen Hookerianum Sikkimense, et fructus descriptionem; Brandis, Ind. Trees, 405 (1906), *pro parte*, quoad "Sikkim" et "corymbs from the old wood" et fruct. descr.; *non* Hook. fil.

Frutex epiphyticus, ramis robustis ut videtur parum ramosis, cortice fusco varie striato et lenticelloso. *Folia* ea *A. auriculatae* ita simulantia ut distinctionem aegre facias, sed utraque pagina obscuriora, id est minus nitida, et forsan paullulo crassius coriacea, interdum angustissime lanceolata (usque 21 cm. longa et 4-5 cm. lata). *Inflorescentiae* abbreviatae, fasciculiformes, totae subtilissime puberulae, plerumque supra cicatrices foliorum delapsorum pseudo-verticillatorum sed non raro etiam procul a foliis vel eorum cicatricibus e ramis vetustioribus ortae, nunquam ut videtur e pseudo-verticillo foliorum hornotinorum terminales; rhachis interdum usque 5-6 mm. evoluta, valde incrassata, sed plerumque omnino suppressa; bractae bracteolaeque parvae, deltoideae; pedicelli sub anthesin 5-9 mm. longi, apice in cupulam 2 mm. latam expansi. *Calyx* (incluso receptaculo) 9-10 mm. longus, puberulus, basi truncatus et acute pentagonus ibique circiter 2 mm. latus; segmenta fere libera, lanceolata, 7-8 mm. longa, circiter 2.5 mm. lata, acuta, conspicue subparallelo-nervosa, basi contigua, sinubus acutissimis in plicas parvas 5 subprominentes abeuntibus. *Corolla* anguste cylindrica, sursum leviter angustata, 1.5-1.8 cm. longa, prominenter 5-angulata vel fere 5-carinata, puberula; lobi lineares usque subspathulati, acuti, circiter 3 mm. longi, in alabastro primaque anthesi erecti apice cucullati. *Filamenta* applanata, inferne leviter angustata, 2 mm. longa, glabra; antherae 1.5 cm. longae, parte pollinifera 4-5 mm. longa papillosa, rostris laevibus apice liberis. *Stylus* gracilis, corollam aequans, glaber, stigmate maiusculo capitato. *Fructus* (iam a C. B. Clarke *l.c.* descriptus) ovoideus, 6-7 mm. longus et fere aequilatus, subexsuccus, ruber, puberulus; calycis segmenta persistentia, conico-conniventia, puberula, plicis 5 ad basin sinuum prominentibus plus minus decurrentibus; pedicelli usque 1.5 cm. longi, cupulo usque 5 mm. lato.

SIKKIM. Teesta, 1200 m., 7 and 13 May 18—, *J. D. Hooker* (Herb. Kew.): "Epiphytic. Calyx and fruit red." Teesta, 1200 m., 12 Nov. 1870, *C. B. Clarke* 13,865B (type, Herb. Kew.). Yankeung, 900 m., 28 Apr. 1876, *C. B. Clarke* 27,668 A and C (Herb. Kew.).

This is the only species of the genus so far known from Sikkim. The leaves so exactly imitate those of *A. auriculata* (Griff.) Hook. fil. that Clarke's failure to distinguish the two species is almost pardonable. In *A. auriculata*, however, they are distinctly glossier on both surfaces, and somewhat thinner in texture, while those of *A. sikkimensis* are on the whole slightly narrower in proportion to their breadth and more gradually narrowed to the apex. Clarke was, of course, mistaken in giving the length of the peduncle of *A. auriculata* as " $\frac{1}{4}$ – $1\frac{1}{2}$ in.," since only the longer measurement is applicable to that species, the peduncle in *A. sikkimensis* being rarely developed at all. The inflorescence is finely pubescent throughout in the present species, even to the mature fruiting stage; that of *A. auriculata* is glabrous *ab initio*. The calyx segments are strikingly dissimilar in the two species: those of *A. sikkimensis* are lanceolate, contiguous at the base where they are pinched into small sharp projecting folds at the base of the acute sinuses; in *A. auriculata* they are much smaller, narrowly subulate, and distinctly separated at the base by rounded or truncate sinuses.

All the specimens cited above are in fruit, except Clarke 13,685B, which has accordingly been chosen as the type. Although Clarke presumably based his remark "corolla tube . . . pubescent without at least when young" upon this specimen, he omitted to cite it, or any of his own collections, under *A. auriculata* in the "Flora of British India."

Both *A. auriculata* and *A. sikkimensis* are closely allied to *A. glabra* (Griff.) C. B. Clarke, which may be known by its long-peduncled, pubescent inflorescences, shorter calyx-segments and generally smaller leaves.

Agapetes angulata (Griff.) Hook. fil. in Benth. et Hook. fil. Gen. Pl. 2, 571 (1876); C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 447 (1881); Brandis, Ind. Trees, 405 (1906).

UPPER BURMA. Nam Tamai valley, 1200–1500 m., 22 Jan. 1931, F. Kingdon Ward 9153 (Herb. Mus. Brit.): "A small straggling shrub in the open forest. Flowers red, with green teeth, scarcely open."

An uncommon species, hitherto known only from Griffith's collection from the Patkoi hills. The rather thin, distantly and shallowly dentate leaves are practically indistinguishable from those of *A. acuminata* (Wall.) D. Don (*Corallobotrys acuminata* C.B.Cl.). [There seem to be no sufficient grounds for maintaining the latter as a distinct genus]. I cannot, however, agree with Clarke that the "leaves, inflorescence and corolla" are "undistinguishable" from those of *A. variegata* (Wall.) D. Don: the leaves, at least, of the latter are readily distinguishable by their much more firmly coriaceous texture, less conspicuously dentate margin and often almost shining upper surface. Clarke, however, included *A. pulcherrima* (Wall.) Hook. f. under *A. variegata*: in that species the leaves are very similar in texture to those of *A. angulata* and probably Clarke

had these before him when stating that he was unable to distinguish the two.

Agapetes Parishii C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 445 (1881); Brandis, Ind. Trees, 404 (1906).

ASSAM. Cachar, "Shapone Kookee poonjee," 19 Mar. 1873, *Ramdane* ex R. L. Keenan (Herb. Kew.; determined by C. B. Clarke as *A. setigera* D. Don). Kohima, Naga Hills, 25° 40' N., 94° 10' E., 1500 m., 10 Jan. 1928, *F. Kingdon Ward* 7791: "A small erect epiphytic shrub, in bud only. In jungle."

UPPER BURMA. SOUTHERN SHAN STATES: Toungyi, 1800 m., Feb. 1888, *H. Collett* 96. In fairly dry oak forest, between Lwemaung and Maungla, 1500 m., Jan. 1910, *W. A. Robertson* 91: "3-4 ft. high; corolla ridged with white." Lakut to Molye, 1500 m., Feb. 1910, *W. A. Robertson* 91A. KARENNI: Nat-toung, 1867, *Rev. C. Parish* (lectotype, Herb. Kew.).

LOWER BURMA. Sandoway Distr.: Gwa chaung, at sea level, 7 Mar. 1929, *C. E. Parkinson* 8835: "Epiphytic shrub, found on *Excoecaria agallocha*, with swollen spindle-shaped stems. Fls. scarlet. Beaks of anthers spurred." Salwin Distr.: Yemukyo, 1825 m., 3 May 1929, *Po Chin* 10,208: "Small bushy evergreen tree in rocky evergreen hill, 8 ft. high, 3 in. in girth. Fr. glabrous, globular, enclosed in persistent 5-cleft calyx, ∞ -seeded; seeds arranged in circular ring, tiny. Fruit-stalk red, thicker at point of attachment to fruit, ramal, single to a cluster of 2-4. Bark smooth, greyish, thin, $\frac{1}{8}$ ". Blaze brownish red. Wood whitish, tough." Amherst Distr.: Thoung gyne, Moolmein, 1500 m., 1857, *T. Lobb* (paratype, Herb. Kew.). Spur to Mulayit, Dawna Range, 600-1800 m., 25 Jan. 1912, *J. H. Lace* 5609 and 5614. Ibid., Apr. 1927, *Shwe Nyau Tha* 12. Ibid., 1200 m., 1 Feb. 1927, *C. E. Parkinson* 5115: "Epiphytic. Flowers deep red." Ibid., just below peak, 1890 m., 3 Feb. 1929, *C. E. Parkinson* 5133: "Epiphytic shrub. Flowers deep red." Mergui Distr.: Ngawun reserve, 12 Feb. 1927, *R. N. Parker* 2585: "Epiphyte with very swollen roots. Flowers pink with darker veins."

At the time of its description in the "Flora of British India" this species was known only from the collections of Parish from the Karen country and of Lobb from Lower Burma. The specimens enumerated above thus extend its known distribution not only into the extreme south of Lower Burma (Mergui) but also into the Shan States and Assam, showing it to be one of the most widespread species of the genus. Its altitudinal distribution is not less remarkable, ranging from sea-level (Sandoway) to close on 1900 m. on the peak of Mulayit (Amherst). It is also noteworthy that, despite the extent of its latitudinal and altitudinal range, *A. Parishii* exhibits relatively little variation—compared, for example, with polymorphic species of more restricted occurrence, such as *A. setigera* D. Don, with which it is sometimes confused in herbaria.

Parkinson notes that the beaks of the anthers of his no. 8835 are spurred: the spurs, however, are vestigial and do not appear to warrant the recognition of this form even varietally.

A. Parishii appears to be closely allied both to *A. setigera* and to *A. variegata*, which differ principally in their apically curved corolla, and fascicled inflorescence, respectively.

Agapetes Brandisiana W. E. Evans in Notes Roy. Bot. Gard. Edinb. 15, 201, fig. 1c (1927).

A. auriculatae Hook. f. *simillima*, "but possibly a new species," Brandis, Ind. Trees, 405 (1906), in obs.

Mr. W. E. Evans's failure to trace the specimen communicated by Montague Hill to Sir Dietrich Brandis and referred to by the latter in his Indian Trees, *l.c. supra*, has recently been explained by the discovery of the specimen, or at least part of it, lying *perdu* in the Kew Herbarium as an undetermined specimen of *Desmogyne*! It consists of four detached leaves and a detached 10-flowered corymb. A description of the corolla and androecium, all but two of which have fallen from the inflorescence, can now be given.

Corolla subcylindrica, acutissime carinato-pentagona, angulis valde prominentibus, sursum levissime ampliata, circiter 2.6 cm. longa (usque ad apices loborum), 6-7 mm. diametro, ipsa basi usque 3-4 mm. plus minus subito angustata, glabra, e sicco ut videtur rubra et pulcherrime anfractuoso-notata; lobi triangulares, 5-6 mm. longi, basi 3-4 mm. lati, acuminati, acuti, carinati, recurvi. *Filamenta* applanata, obovato-oblongeolata, subsigmoidea, 6-7 mm. longa, 1-1.5 mm. lata, apicem versus pubescentia et valde caudato-attenuata, fere filiformia, basi corollae adnata, marginibus inter se leviter cohaerentes; antherae angustissimae, 2.5 cm. longi, sub anthesin 3-4 mm. exsertae, 3-4 mm. supra basin dorsifixae, inter se cohaerentes, parte pollinifera papillosa 5-6 mm. longa, rostris laevibus apice liberis dorso ecalcaratis. *Stylus* gracilis, 2.8 cm. longus, glaber, stigmatibus parvis capitatis.

UPPER BURMA. On granite boulders, hills east of Bhamo, 1950 m., Febr. 1902, *Montague Hill* 197 (Herb. Kew.; presented by Sir Dietrich Brandis, 25 Aug. 1903).

This interesting species, though superficially "similar" to *A. auriculata* Hook. f. in the cup-shaped apical expansion of the pedicel, is probably more closely allied to *A. Parishii* C.B.Cl., though the leaves of the latter are attenuate, not more or less rounded, at the base, and the cup-shaped expansion at the apex of the pedicel is not so strongly developed as in *A. auriculata*. The truncate base of the receptacle, however, sometimes shows a tendency to forming a ring-like outgrowth approaching the remarkable structure characteristic of *A. Brandisii*.

Agapetes Nuttallii C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 445 (1881); Brandis, Ind. Trees, 405 (1906).

C. B. Clarke erroneously described the corolla of this species as "straight." It is, on the contrary, distinctly curved at the apex, indicating that the affinity is probably with *A. macrostemon*, *A. Lobbii*, etc. The species is apparently rare, being at present known only from the type collection (Bhutan, *Nuttall*).

Agapetes setigera (Wall. ms.) D. Don ex G. Don, Gen. Syst. Gard. & Bot. 3, 286 (1834) ; C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 443 (1881) ; Brandis, Ind. Trees, 404 (1906).

Clarke's treatment of this variable species is not entirely satisfactory. A re-examination of the material in the Kew Herbarium indicates the advisability of recognising one or two additional varieties, while I am unable to follow Stapf (Bot. Mag. sub t. 9040) in raising var. *Roylei* (Kurz) C.B.Cl. to the rank of a distinct species. The following disposition of varieties is proposed.

var. **typica** *Airy-Shaw*.—Clarke's statement (*l.c.*) that the species *A. setigera* D. Don *sensu stricto* is "common" in the Khasia Hills is not borne out by the Kew material, for only three collections agree with the type in the Wallich Herbarium. These are all characterized by very large leaves: the measurements given by Clarke ("4½ by 1¾ in."—11.5 by 4.5 cm.) are quite inadequate, some of the leaves on specimens collected by Hooker and Thomson measuring up to 15 by 7 cm. The inflorescence is fairly densely setose and also finely puberulous, and the calyx-teeth are subulate, 3–4 mm. long.

KHASIA. Pundua and Sylhet, 1821, *F. de S[ilva]*. in *Herb. Wall.* no. 752 (type of *Thibaudia setigera* Wall.). Chura, 15 June 1850, *Hooker & Thomson* 847. Mamlou, 19 June 1850, *Hooker & Thomson* 1125: "Shrub, 8-pedalis, peduncles red." *Ibid.*, 14 Nov. 1850, *Hooker & Thomson* (*sine numero*).

var. **verticillata** (Wall. ms.) C. B. Clarke in Hook. fil. Fl. Brit. Ind. *l.c.*, *sensu stricto*.—Leaves narrowly oblanceolate, 7–15 cm. long, 1.5–4 cm. wide, very conspicuously whorled in the type specimen, whorls 6–8 cm. apart; inflorescence rather sparsely setose, not puberulous in addition; calyx-segments scarcely more than 2 mm. long; corolla completely glabrous; filaments glabrous, connective pubescent at base.

KHASIA. E montibus Pundooa Bengalae orientalis, 1821, *M. R. Smith* in *Herb. Wall.* no. 753 (type of *Thibaudia verticillata* Wall.). Mahadeo, 9 Oct. 1835, *Wallich* (*Assam deputation*) (*Herb. Kew.*).

All the other specimens in *Herb. Kew.*, written up by C. B. Clarke as var. *verticillata*, differ from the type specimen in the double nature of the indumentum of the inflorescence, being finely puberulous as well as glandular-setose. I propose, therefore, to distinguish them as follows.

var. **pseudo-verticillata** *Airy-Shaw*, var. nov.; a var. *verticillata* (Wall.) C.B.Cl., vera, inflorescentia non tantum glanduloso-setosa sed etiam subtiliter puberula, corolla subtiliter puberula et (praecipue secus angulos) sparse setosa recedens.

Thibaudia [sp.] Griff. Itin. Notes, 30 (1848), cum descr. brevi.
? *Vaccinium Wallichianum* Wight, Ic. Pl. Ind. Or. 4, 3, t. 1180 (1848-1850).

? *Agapetes Wallichiana* Klotzsch in Linnaea, 24, 38 (1851).

Thibaudia obliqua Griff. Notul. Pl. Asiat. 4, 301 (1854); Ic. Pl. Asiat. p. xi, t. dxv (1854).

Agapetes setigera var. *verticillata* C.B.Cl. in Hook. fil. Fl. Brit. Ind. 3, 443 (1881), pro maxima parte, secundum specimina Kewensia ab ipso auctore determinata, non *Thibaudia verticillata* Wall.

KHASIA. Between Moosmai and Mahadeb, 1837, *Griffith* 478 (Herb. Kew.). Mamloo, 29 Aug. 1850, *Hooker & Thomson* 2183 pro parte (type, Herb. Kew.): "fl. scarlet, deep." Mansmai, 1200 m., 11 Dec. 1871, *C. B. Clarke* 14,285: "Stamens 10, unipore. Ovary inferior. Disc very much elevated. Corolla with V-shaped striae. Calyx semi-5-fid, hairy. Corolla hairy without; stigma green." Sohra Coal Hill, 1350 m., 28 Nov. 1871, *C. B. Clarke* 15,195: "Calyx nearly glabrous. Corolla deep red, indistinctly V-barred."

var. **macrosepala** *Airy-Shaw*, var. nov.; a var. *typica* inflorescentia multiflora valde glanduloso-setosa atque puberula, calycis segmentis 4-6 mm. longis distincta.

Vaccinium verticillatum Wight, Ic. Pl. Ind. Or. 4, t. 1181 (1848-1850), excl. descr. (p. 4); non *Thibaudia verticillata* Wall., nec *Agapetes verticillata* D. Don.

Vaccinium hirsutum Wight, l.c. 4, 4, t. 1182 (1848-1850).

Agapetes setigera C.B.Cl. in Hook. fil. Fl. Brit. Ind. 3, 443 (1881), pro parte, non *Thibaudia setigera* Wall.

KHASIA. Pundua and Sylhet, 1821, *F. de S[ilva]*, in *Herb. Wall.* no. 752, tantum quoad unum specimen ex Herb. Hook., non in Herb. Wall. propr. "Khasiya," *Griffith* 313 (Herb. Kew.). Nunkloo, Feb. 1850, *Simons* 109. Above Cherrapoonji, 1200 m., Jan. 1897, *Dr. King's Collector* (type, Herb. Kew.).

There has been much confusion and misplacement of labels in connection with Wallich's specimens of "*Thibaudia*" in the Hooker herbarium. The sheet quoted in the above paragraph bears a leafless branch with several subterminal corymbs of unexpanded flowers. It also bears four detached leaves: the three on the right of the flowering branch are, as noted on the sheet in pencil in an unknown hand, evidently those of *Agapetes variegata* D. Don; the one on the left of the branch matches those of the other specimens of var. *macrosepala* quoted above, and in all probability actually belongs to the flowering branch. The label attached to the sheet is cut from a copy of Wallich's Catalogue and bears the legend "752."

Thibaudia setigera Wall. *Thibaudiae variegatae* var.? *Pundua*, F. de S." The type sheet of this number in Wallich's own herbarium, however, bears two branches with numerous attached leaves and inflorescences of fully expanded flowers: the inflorescences are less setose than in var. *macrosepala* and the calyx-teeth do not exceed 4 mm. in length. C. B. Clarke, as is shown by a note attached to the Herb. Hooker sheet, mistook the three detached leaves of *A. variegata* for those of *Thibaudia verticillata* Wall. (no. 753), apparently overlooking the fourth leaf, which is obviously neither that of *variegata* nor of *verticillata*, and also the discrepancy in the sepals and flowering stage.

It is, of course, just possible that this specimen is not a Wallichian specimen at all, but part of the collection labelled "Khasiya, Griffith, 313" (cited above), which, like the "pseudo-Wallichian" specimen, is in the bud stage, and likewise emanates from the Hooker herbarium. This supposition receives support from the circumstance that Wight (*l.c. supra*) definitely states that he is "indebted to Mr. Griffith" for his specimens of *Vaccinium verticillatum* Wight, which he figures on his tab. 1181 and which certainly appears to represent var. *macrosepala*. It is difficult, however, to reconcile certain discrepancies between Wight's plate and his description. The latter is a *verbatim* translation of Dunal's Latin description in DC. Prodr. 7, 554 (1839), itself a fairly close adaptation of that in G. Don, Gen. Syst. 3, 862 (1834). The corolla is described as "glabrous" without qualification: the plate agrees with this statement except for the enlarged drawing of a flower, in which both calyx and corolla are represented as densely hairy. Wight explains this as "entirely owing to the imperfection of our lithography, for in the original drawing it [the corolla] is shown scarcely even pubescent." Now Wallich's *Thibaudia verticillata* (*Agapetes verticillata* D. Don, cited by Wight in synonymy) has a glabrous corolla (see var. *verticillata* C.B.Cl., *supra*), but the calyx-lobes are deltoid, barely 2 mm. long.

The fact that Wight states that he obtained his specimens of *Vaccinium verticillatum* from Griffith, together with the fact that he quoted the description second-hand, instead of supplying an original one, might be taken as conclusive evidence that he never saw a type specimen of Wallich's *Thibaudia verticillata*. In the text to his tt. 1180 and 1182, however, he states that the specimens there figured were received from Dr. Wallich, "without station or name." Tab. 1182 (*Vaccinium hirsutum* Wight, sp. nov.) represents a plant almost identical with that depicted on tab. 1181, except that the calyx-segments are very slightly shorter (4-5 mm. long). The most curious feature about the plate is that the specimen figured is in bud, exactly as in the "pseudo-Wallichian" specimen no. 752 and as in Griffith's Khasia specimen from Herb. Hooker. Is it possible that at one time Wallich actually possessed specimens of the plant here distinguished as var. *macrosepala*, but confused

them with his *Thibaudia setigera* (no. 752) and distributed them as duplicates of that number, leaving none in his own herbarium? Examination of the set of Wallich's plants at Geneva would perhaps throw light on the problem, but for the present it must remain unsolved.

var. **acuminata** *Airy-Shaw*, var. nov.; a var. *verticillata* (Wall.) C. B. Clarke, vera, foliis elongatis angustissime ellipticis 10–18 cm. longis 2.5–3.7 cm. latis acuminatis, inflorescentiis puberulis (et sparse setosis), corolla secus angulos sub lente minutissime puberula distincta.

Agapetes setigera var. *verticillata* C. B. Clarke in Hook. fil. Fl. Brit. Ind. **3**, 443 (1881), pro parte, non *Thibaudia verticillata* Wall.

KHASIA. Mamloo, 14 Nov. 1850, *Hooker & Thomson* (Herb. Kew.). Mahadeo, 16 Nov. 1850, *Hooker & Thomson* (type, Herb. Kew.): "Fl. obscurely angled, pink tipped with green."

var. **parviflora** (Kurz) *Airy-Shaw*, comb. nov.

Thibaudia variegata Royle, Ill. Bot. Himal. Mount. 257, t. "63a or 79," fig. 1 (1835), non *Ceratostema variegatum* Roxb. (1832).

Vaccinium variegatum var. *parviflorum* Kurz in Journ. As. Soc. Beng. **42**(2), 84 (1873).

Vaccinium Roylei Kurz in Journ. As. Soc. Beng. **46**(2), 214 (1877).

Agapetes setigera var. *Roylei* C. B. Cl. in Hook. fil. Fl. Brit. Ind. **3**, 443 (1881).

Agapetes Roylei Stapf in Bot. Mag. **159**, sub t. 9040 (1925).

KHASIA. Mamloo, 19 June 1850, *Hooker & Thomson* 1125 (Herb. Kew.). Ibid., 29 Aug. 1850, *Hooker & Thomson* 2183, pro parte (Herb. Kew.). Manksandrum, 1200 m., 7 Dec. 1871, C. B. Clarke 14,400A. Shaila, 900 m., 9 Dec. 1871, C. B. Clarke 14,873. Mansmai, 1200 m., 21 Oct. 1871, C. B. Clarke 16,260A.

Under International Rules, a variety must bear the earliest available *varietal* epithet, in this case *parviflorum* of Kurz, which antedates *Roylei* of Clarke by eight years, though Kurz perpetuated Royle's error in referring the variety to *Vaccinium* (*Thibaudia*) *variegatum*.

The specimen figured by Royle as *Thibaudia variegata* is not extant in Herb. Kew. Royle himself gives no clue as to its origin, citing only Wallich no. 751 and the localities given by Roxburgh (Fl. Ind. ed. Carey, **2**, 413: 1832) for *Ceratostema variegatum*. The plate represents a plant with leaves as broad as *A. setigera* var. *typica*, and therefore considerably broader than those of any of the above-cited Khasia specimens: in this respect it approaches *A. speciosa* Hemsl.

The two portions of Hooker and Thomson's no. 2183, cited here and under var. *pseudo-verticillata* respectively, are, apart from the presence or absence of indumentum, quite indistinguishable. To accord Royle's plant specific rank, as Stapf has done, would

therefore necessitate similar treatment for var. *pseudo-verticillata* and probably several other varieties : a course which, in the present state of our knowledge, seems eminently undesirable.

Agapetes Lobbii C. B. Clarke in Hook. fil. Fl. Brit. Ind. **3**, 448 (1881) ; Brandis, Ind. Trees, 405 (1906).

A. corallina Cowan in Notes Roy. Bot. Gard. Edinb. **18**, 36 (1933).

A. stenantha Rehder in Journ. Arn. Arb. **14**, 350, t. 74 (1933), e descr. et icone.

No affinity was suggested by Dr. Cowan for his *Agapetes corallina*, based on *Sukoe* 34 from Htawgaw Hill, Upper Burma, and only *A. corallina* and *A. vaccinioides* were put forward by Dr. Rehder as possible allies for his *Agapetes stenantha*, based on *Rock* 7514 from the Burma-Yunnan border. Both new species appear, however, to be indistinguishable from *A. Lobbii* C. B. Cl., itself a species whose true affinity escaped both its author and Brandis, who laid too much stress on the character of the deeply divided corolla. *A. Lobbii* not only, as Clarke says, "much resembles" *A. saligna* (Hook. f.) Hook. f., but is undoubtedly closely allied to it and also to the group with apically curved corollas, particularly *A. macrostemon* (Kurz) C.B.Cl. The corolla of *A. Lobbii* itself has a slight but quite distinct curve at the apex.

ASSAM : NAGA HILLS. Kohima, 1800 m., 28 Feb. 1882, *Watt* 6180. Pulma (?) lodge, Dec. 1886, *Prain*. Jowai, 900 m., Feb. 1897, *Dr. King's Collector*. Kohima, 25° 40' N., 94° 10' E., 1500 m., 10 Jan. 1928, *F. Kingdon Ward* 7788 : "An erect epiphytic shrub, sometimes growing many feet high and branching freely, so that it may become almost as large as the supporting tree. Flowers translucent cherry red, the base of the corolla darker, the reflexed lobes almost colourless ; borne in large bunches. A beautiful plant, growing in forest."

BURMA. On trees, 1500 m., Thoung-gyne (not "-gyun" as in F.B.I.), Moulmein, 1857, *Lobb* (type, Herb. Kew.) : "Shrub, 3 ft. Flowers crimson with a white tip." On trees, top of "Thoung-gyein," Moulmein, 1500 m., *Lobb* : "Shrub, 3 ft. Red." (This specimen was referred by C. B. Clarke to *A. saligna* Hook. f.). (There is also a *Lobb* specimen in Herb. Kew. received from Messrs Veitch in March 1868 under the number 49.) Lat. 26° 14' N., long. 98° 25' E., 2400 m., May 1925, *Forrest* 26,591 : "Shrub, 4 ft., epiphytic on forest trees on the hills. Flowers ruddy green." Upper Chindwin Distr.: Uyu Res., Mansi Div., slope of Taungthonlon peak, 1500 m., 23 Feb. 1929, *Sukoe* 9052 : "Parasitic shrub on other trees. Stem brownish. Leaves caudate. Fl. purplish, on old twigs or stem." Myitkyina Distr.: Langyang (Htawgaw), 1200 m., 15 June 1929, *Sukoe* 10,101 : "Epiphytic shrub. Roots tuberous. Fruit silvery light green, pedicellate." Htawgaw Hill, 1380 m., 30 Nov. 1930, *Sukoe* 34.

Agapetes Moorei Hemsl. in Bot. Mag. **129**, t. 7928 (1903).

A. Unwinii W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15**, 205, t. ccxxi (1927).

Comparison of the type specimens of these two species leaves no doubt as to their being conspecific. The affinity of *A. Moorei* is evidently with *A. macrostemon* (Kurz) C. B. Cl., as noted by Mr. Evans for *A. Unwinii*, but Hemsley compared it only with *A. setigera* D. Don and *A. verticillata* D. Don, in which the filaments are very short. He remarked, however, that "in floral structure it is more closely related to *A. buxifolia* Nutt.," a species with small leaves and solitary flowers, but with rather long filaments somewhat geniculate at the base as in *A. Moorei*. The corolla of *A. buxifolia* is, however, straight, not curved at the apex, and the slender habit and small leaves in conjunction with the long filaments are sufficient to exclude the possibility of relationship with the present species.

Some doubt attaches to the country of origin of the type-specimen of *A. Moorei*. It was said to have been imported with a species of orchid believed to be a native of Sikkim. But Professor R. Unwin's discovery of the plant in 1926 on Mount Victoria, east central Burma, makes it highly probable that Burma was also the source of the original specimen, since no species of *Agapetes* are as yet known both from that country and from the Sikkim Himalaya.

Agapetes sp. nov. (material insufficient for description).

ASSAM. Delei valley, 28° 5' N., 96° 30' E., 1500 m., 19 Mar. 1928, *F. Kingdon Ward* 7977 (Herb. Kew.); "A small erect branching undershrub, growing on granitic rocks in full sun. In fruit."

Probably near *A. salicifolia* C.B.Cl., but the leaves are much broader and the axis of the inflorescence is very short.

Series ii. GRACILES.

Leaves over 6 cm. long, often long and narrow :

Leaves over 1.5 cm. wide :

Calyx-limb entire or shallowly undulate, widely cup-shaped ;
leaves firmly coriaceous, margin generally revolute.....

A. neriifolia (King et Prain) Airy-Shaw

Calyx-limb distinctly 5-fid, more or less erect :

Calyx-limb divided about half-way down ; leaves firmly
coriaceous, up to 4 cm. wide.....

A. pseudo-Griffithii Airy-Shaw

Calyx-limb divided to base ; leaves thinly chartaceous,
almost membranous :

Leaves oblong, abruptly and shortly caudate, narrowed at
base, 8-15 cm. long, 2-5 cm. wide.....

A. Griffithii C. B. Clarke

Leaves lanceolate, gradually attenuate-acuminate, rounded at base, 7–8.5 cm. long, 1.5–2.1 cm. wide.....

A. hyalocheilos Airy-Shaw

Leaves less than 1.5 cm. wide :

Calyx-limb divided to base ; peduncle puberulous ; pedicels not expanded into a cup at apex.....*A. nutans* Dunn

Calyx-limb divided half-way down or less ; peduncle glabrous ; pedicels expanded into a cup at apex :

Peduncle and pedicels much thickened upwards ; corolla subconical, up to 1.5 cm. long.....

A. linearifolia C. B. Clarke

Peduncle and pedicels uniformly slender ; corolla cylindric, 2–2.5 cm. long.....*A. angustifolia* (Knagg) Airy-Shaw

Leaves less than 6 cm. long :

Leaves acuminate or subacuminate, 2–5 cm. long ; inflorescence several-(up to 8-) flowered :

Leaves cuneate at base ; pedicels with distinct cupular expansion at apex ; calyx-limb membranous, widely cup-shaped, about 8 mm. long, divided to about three-fourths ; corolla divided almost to base into linear segments.....

A. discolor C. B. Clarke

Leaves subcuneate to rounded at base ; pedicels not or scarcely cupuliform-expanded at apex ; calyx-limb herbaceous, divided almost to base into short deltoid segments scarcely 2 mm. long ; corolla-lobes very short, deltoid, about 1 mm. long.....

A. Forrestii Diels

Leaves acute but not acuminate, less than 2 cm. long ; inflorescence 1–2-flowered :

Nerves rather finely elevate-reticulate, especially above ; inflorescence a very slender 2-flowered corymb, peduncle and pedicels subequal, together up to 4.5 cm. long ; calyx-segments lanceolate, about 3 mm. long ; corolla nearly 2.5 cm. long.....

A. mitrarioides Hook. fil.

Nerves deeply impressed above, invisible below ; inflorescence 1–2-flowered, almost a fascicle, the peduncle almost obsolete, pedicels up to 1 cm. long ; calyx-segments deltoid, 1–2 mm. long ; corolla up to 1.5 cm. long.....

A. praeclara Marquand

***Agapetes neriifolia* (King et Prain) Airy-Shaw, comb. nov.**

Desmogyne neriifolia King et Prain in Journ. As. Soc. Beng. **67** (2), 297 (1898) ; Prain in Ann. Roy. Bot. Gard. Calc. **9** (1), 46, t. 59 (1901) ; Brandis, Ind. Trees, 406 (1906) ; Evans in Notes Roy. Bot. Gard. Edinb. **15**, 207 (1927).

Agapetes Desmogyne King et Prain, l.c., 298, *nomen eventuale*.

The series *A. Griffithii* C. B. Cl.—*A. nutans* Dunn—*A. linearifolia* C. B. Cl.—*Desmogyne neriifolia* King et Prain provides such a gradual transition from more “typical” species of *Agapetes* to the extreme type represented by *D. neriifolia* that the reduction of

Desmogyne to *Agapetes* becomes a matter of course. King and Prain (Journ. As. Soc. Beng. **67** (2), 297 : 1898), when establishing *Desmogyne*, contemplated the possibility of this reduction, but regarded such a union as contingent upon the similar reduction to *Agapetes* of the genus *Pentapterygium*. It is possible that a critical review of this alliance may indicate the desirability of the latter reduction, but *Pentapterygium* is so much more distinct from *Agapetes* than is either *Desmogyne* or *Corallobotrys* that (provisionally, at least) it seems preferable to keep them distinct.

Under International Rules the name *Agapetes Desmogyne*, proposed by King and Prain (*l.c.*) for *Desmogyne neriifolia* in the event of its transference to *Agapetes*, cannot be used, being a *nomen eventuale*. The epithet accepted and published by the authors was *neriifolia*, necessitating the new combination effected above. *Desmogyne angustifolia* Knagg in Notes Roy. Bot. Gard. Edinb. **14**, 73 (1923) similarly becomes ***Agapetes angustifolia* (Knagg) Airy-Shaw**, comb. nov. No material has yet been seen of *Desmogyne minor* King et Prain in Ann. Roy. Bot. Gard. Calc. **9** (1), 47 (1901), in obs. : the transference (if necessary) is therefore held over until the opportunity occurs of examining the type specimen.

***Agapetes pseudo-Griffithii* Airy-Shaw**, sp. nov. a peraffini *A. Griffithii* C. B. Cl. foliis angustioribus sensim acuminatis (nec subito caudatis) firme coriaceis (nec tenuiter chartaceis) satis distincta.

Frutex epiphyticus, ut videtur parum ramosus. *Rami* teretes, 1-2.5 mm. diametro. *Folia* lanceolata usque oblonga, rarius elliptica vel fere oblanceolata, 9-14 cm. longa, 2-4 cm. lata, basi subcuneata usque subrotundata, apice sensim caudato-acuminata subtilissime acuta, integerrima, plana vel marginibus levissime recurva, firme coriacea, glaberrima, siccitate griseo-viridia, costa supra impressa infra prominente, nervo submarginali utrinque unico conspicuo fere usque ad apicem percurrente, nervis ceteris secundariis indistinctioribus supra impressis infra prominentibus valde reticulatis ; petiolus 4-8 mm. longus, 1-2.5 mm. crassus, transverse rugulosus, supra sulco alto percursus, fuscus vel cortice exfoliato lutescens. *Racemi* axillares, corymbiformes, 4-6-flori, toti 7-11 cm. longi ; axis 3.5-7 cm. longus, inferne per 3-6 cm. nudus, parte superiore ubi pedicelli oriuntur incrassata ; pedicelli incrassati, subcarnosi, 0.5-2 cm. longi, basi bractea minuta deltoidea acuta atque bracteolis duabus similibus suffulti, longitudinaliter 5-costati, glaberrimi, apice in cupulam 3-4 mm. diametro 2 mm. altam expansi. *Calyx* (incluso receptaculo 2-3 mm. diametro) totus 1.3-1.5 cm. longus, 5-7 mm. latus, membranaceus, venosus, glaber, tubi parte libera 5-6 mm. longa, dentibus erectis lanceolato-subulatis acutissimis 5-6 mm. longis basi 2-3 mm. latis. *Corolla* cylindrica, basi leviter angustata, circiter 2.6 cm. longa (inclusis dentibus parvis deltoideis acutis erectis viridibus 2-2.5 mm. longis et latis),

5–10 mm. lata, corallina, glaberrima. *Stamina* tota circiter 2.5 cm. longa : filamenta applanata, lineari-subulata, circiter 5 mm. longa, vix 1 mm. lata, sub lente parce minutissime puberula ; antherae circiter 2.1 cm. longae, anguste subulatae, paullum supra basin dorsifixae, thecis minutissime papilloso, rostris laevibus apice conniventibus dorso ecalcaratis. *Stylus* gracillimus, 2.5 cm. longus, stigmatibus albo punctiforme. *Fructus* ignotus.

UPPER BURMA. Hills east of the Nam Tisang, 1200–1500 m., 5 Jan. 1931, *F. Kingdon Ward* 9101 (Herb. Mus. Brit.) : “ Epiphyte in the jungle. Flowers crimson.” Nam Tainai valley, 1200–1500 m., 15 Jan. 1931, *F. Kingdon Ward* 9144 (type, Herb. Mus. Brit.) : “ A common epiphyte in the forest. Flowers crimson with green teeth.”—I refer also to this species the following imperfect specimen : Nam Tisang–Mali divide, 1800 m., 13 Nov. 1922, *F. Kingdon Ward* 5551 (Herb. Edin.) : “ Epiphyte in the forest. Flowers stiff, like wax. Corolla tube coral red, the tips of the perianth lobes dull green.”

var. **Abbayana** *Airy-Shaw*, var. nov. calycis aequilongi ac in typo lobis subduplo brevioribus deltoideis 2–3 mm. longis, foliis haud ultra 10.5 cm. longis et 2 cm. latis distincta.

UPPER BURMA. N.E. Frontier, 1913, *Capt. B. N. Abbey* (type, Herb. Edin.).

Closely allied to *A. Griffithii* though the present species undoubtedly is, the leaf-shape and texture at once distinguish it. Unfortunately the type specimen of *A. Griffithii* is in extremely young bud, rendering a comparison of floral parts impossible, since no later collection of that species is available. The inflorescence of *A. pseudo-Griffithii* is very similar to that of *A. linearifolia* C. B. Cl., but the corolla of the latter is only about half as long.

In the variety *Abbayana* the calyx is approximately the same length as in the type, but, instead of being divided half-way down, is scarcely divided to one quarter. All the corollas have fallen from Abbey's specimen.

Agapetes linearifolia C. B. Clarke in Hook. fil. Fl. Brit. Ind. **3**, 449 (1882) ; *Airy-Shaw* in Hook. Ic. Pl. **33**, t. 3254 (1935), *ined.* ; descr. hic amplif. ; ab *A. nutante* Dunn inflorescentia multo brevius pedunculata, pedunculo glabro, pedicellis apice conspicue cupulatum expansis, calyce maiore vix ad medium usque fisso, corolla subduplo brevioris discedit ; ab etiam affinis *A. neriifolia* (King et Prain) *Airy-Shaw* foliis angustioribus, calyce 5-lobato nec subintegro, corolla multo minore, ab *A. angustifolia* (Knagg) *Airy-Shaw* pedicellis carnosius nec filiformibus, praecipue differt.

Suffrutex epiphyticus, radicibus scandens, glaberrimus, basi bulbosa vel tumida (teste F. K. Ward), radices tuberosas anguste napiformes hinc inde emittens. *Caules* humiles, parce ramosi, 30–40 cm. alti, 1–2 mm. crassi, teretes, lenticellis parvis sparsis

praediti, cortice cinereo-brunneo. *Folia* alterna, subdistiche disposita, lanceolato-linearia, 10–15 cm. longa, 0.7–1.3 cm. lata, in apicem acutissimum sensim attenuata, basi in petiolum robustum 2–4 mm. longum supra canaliculatum rotundato-contracta, margine valde revoluta, pagina superiore siccitate plumbeo-viridi costa impressa, pagina inferiore pallidior et laetior vel rufescente costa valde prominente, nervis lateralibus obscuris. *Racemi* axillares, pendentes, corymbosi, foliis breviores, usque 8 cm. longi; axis 1.5–4.5 cm. longus, apicem versus incrassatus, striatus; bractee et bracteolae minutissimae, deltoideae, ima basi pedicellorum sitae. *Pedicelli* apicem axis versus conferti, ex foveolis velut excavationibus eius orti, ima basi subito valde contracti, apicem versus incrassati, usque 2.2 cm. longi, apice articulati et in cupulam 2–5 mm. diametro ovarium (receptaculum) sub anthesin semi-amplectentem expansi. *Receptaculum* subglobosum, sub anthesin 2–3 mm. longum et latum, sed post fecundationem statim valde auctum, usque 1 cm. diametro, scarlatinum. *Calyx* breviter ellipsoideo-cylindricus, 5–6 mm. diametro, tubo 3–6 mm. longo membranaceo 5-nervi, lobis anguste triangularibus circiter 3 mm. longis basi 1–3 mm. latis acutissimis. *Corolla* cylindrico-conica, 1.3–1.4 cm. longa, basi circiter 4 mm., ore circiter 2 mm. diametro, lobis brevissimis deltoideis acutis vix recurvis, glabra, viridis, glaucescens, basi siccitate pallidior. *Filamenta* circiter 5 mm. longa, glabra, nonnunquam abnormaliter in tubum plus minus perfecte connata. *Antherae* anguste lanceolatae, 9–10 mm. longae, ad sinus corollae attingentes, thecis densissime scabro-papillosis circiter 4 mm. longis dorso ealcaratis basi obscure appendiculatis, rostris siccitate pallidis laevibus 5–6 mm. longis inferne connatis dorso ealcaratis. *Stylus* filiformis, 1.4 cm. longus, stigmate inconspicuo. *Fructus* ignotus.

ASSAM. Mishmi Hills: Thumath Summit, 1836, *Griffith* (Kew distrib. no.) 3480 (type): "Frutex epiphytic. Pedunc. pedicell. calyc. rosaceo-carneis, alab. livido-caeruleis." Camp, Chibaon, Delei valley, 28°10' N., 96°30' E., 1800 m., 6 Apr. 1928, *F. Kingdon Ward* 8021: "An epiphytic root climber. Base bulbous. Corolla green; pedicel, calyx and ovary scarlet. Flowers passing over. A somewhat straggling and lolling plant of the temperate rain forest."

It is satisfactory to be able to complete the description of this rare and distinct species from the excellent specimens brought home by Capt. Kingdon Ward, nearly a century after the original discovery of the species by Griffith. Except that the leaves of the type specimen are rather more strongly revolute, the agreement between Griffith's sterile and Ward's flowering specimens is perfect.

Agapetes hyalocheilos *Airy-Shaw*, sp. nov. ex affinitate *A. Griffithii* C. B. Cl., a qua foliis minoribus lanceolatis subsessilibus basi rotundatis, pedunculo duplo brevior recedit.

Agapetes saligna var. *cordifolia* C. B. Cl. in Hook. fil. Fl. Brit. Ind. 3, 445 (1881).

Frutex epiphyticus. *Ramuli* graciles, lenticellis parvis rotundis parce conspersi. *Folia* lanceolata, 7-8.5 cm. longa, 1.5-2.1 cm. lata, basi rotundata (unde epitheton Clarkeanum "*cordifolia*" plane ineptum), subcaudato-acuminata, subtilissime acuta, integra, angustissime hyalino-cartilagineo-marginata, plana, glabra, submembranacea, costa et nervis marginalibus gracilibus, nervis ceteris inconspicuis; petioli 1-2 mm. longi. *Racemus* (in specimine unicus) brevis, axillaris, corymbiformis, axi vix 1.5 cm. longo gracili glabro, floribus e summo triente ortis. *Pedicellus* (e flore unico suppetente) fere 1.9 cm. longus, sursum sensim ampliatus, glaber, basi bractea minuta deltoïdea suffultus, bracteolis non visis. *Calyx* totus 6-7 mm. longus, basi truncatus, apici pedicelli aequilatus, glaber, segmentis subulatis acutis 3 mm. longis fere usque ad basin liberis dorso carinatis. *Corolla* anguste infundibularis, 2 cm. longa, basi 4 mm. ore 9 mm. diametro, lobis brevissimis late deltoïdeis rotundatis brevissime reflexo-cuspidatis 1-2 mm. longis 2-3 mm. latis. *Stamina* tota fere 1.8 cm. longa: filamenta applanata, 2-3 mm. longa, fere 1 mm. lata, minute papilloso-ciliolata; antherae 1.5-1.6 cm. longae, inferne papillosae, superne laeves, dorso ecalcaratae, rostris liberis. *Stylus* 2 cm. longus, filiformis, stigmate punctiformi. *Fructus* ignotus.

ASSAM (E. BHUTAN). Daphla Hills: Teniv Lampa, 1050 m., 1880, *Dr. G. King* (type, Herb. Kew.): "*Vaccinium* growing on trees."

This appears to be so distinct from any known species that I have ventured to describe it in spite of the meagre material available. It is strange that Clarke should have treated it as a variety of *A. saligna* Hook. f., which has very different coriaceous leaves with strongly impressed veins, and inflorescences from the old wood. Membranaceous leaves are not common in this genus, *A. Griffithii* C. B. Cl. being the only other species with leaves comparable in texture.

Attached to the sheet in the Kew Herbarium is a drawing of the specimen, in which the only flower is represented as springing terminally from the extreme apex of the branchlet. Apparently Clarke did not recognise the mistake, for he has written below the drawing: "I do not understand the inflorescence"!

Agapetes Forrestii W. E. Evans in Notes Roy. Bot. Gard. Edinb. 15, 202, t. ccxx (1927).

ASSAM. Chibaon, Delei Valley, 28°10' N., 96°30' E., 2100-2400 m., 12 Apr. 1928, *F. Kingdon Ward* 8061: "Epiphytic in the mixed forest, common on the ridge. Usually hanging down in long loose branches. Flowers scarlet, the points of the corolla green."

UPPER BURMA. Base Camp, Seinghku Wang, 1800 m., 24 May 1926, *F. Kingdon Ward* 6749: "Epiphyte on moss-bound gnarled trees in dense tanglewood forest, on steep sheltered slopes. Corolla bright brick-red with a regular **WW** pattern of darker veining; teeth green."

The leaves of no. 6749 are broader and shorter than usual, reaching 1.7 cm. in width but not exceeding 3 cm. in length. *A. Forrestii* may possibly, as Evans suggests, be very distantly related to *A. Bulleyana* Diels, but its closest affinity is with *A. mitrarioides* Hook.f. ex C. B. Cl. and *A. praeclara* Marquand, from both of which it is readily distinguished by its larger caudate leaves.

Agapetes praeclara Marquand in Journ. Linn. Soc. **48**, 197 (1929).

S.E. TIBET. Tsangpo Gorge, near Pemakochung, 2100 m., 28 Nov. 1924, *F. Kingdon Ward* 6323 (type): "Hanging from rocks and trees in the rain forest. Flowers crimson, just opening."

Although no further material of this species (the only one collected on the 1924 expedition) has been seen, I enumerate it here for the sake of completeness. The opportunity is taken also of pointing out that the resemblance to *A. Lacei* Craib is probably only a superficial one: the true affinity of *A. praeclara*, despite the great reduction of the peduncle, is certainly with *A. Forrestii* Diels, with which it agrees in the texture, nervation and colour of the leaves, and in floral structure. In *A. Lacei* the leaves, in the dried state, are transversely wrinkled on the upper surface in a very characteristic manner, the nerves being quite invisible; whereas in *A. Forrestii* and the present species the nerves are almost bullately impressed. The difference in length of filaments, noted by Marquand, corresponds to the definitions of the two series (*Graciles* and *Longifiles*) to which *A. praeclara* and *A. Lacei* respectively belong.

Series iii. LONGIFILES.

Flowers racemose or corymbose (peduncle developed):

Bracts large, 5–15 mm. long, 2–4 mm. wide, persistent:

Leaves rather abruptly caudate-acuminate, up to 6 cm. long; calyx-teeth distinct almost to base; corolla divided at least half-way down into linear lobes.....

A. bracteata Hook.fil.

Leaves gradually acuminate-attenuate, 12–18 cm. long; calyx-teeth connate more than half-way; corolla-lobes very short, deltoid.....

A. Pottingeri Prain

Bracts minute or early caducous; leaves rather abruptly to gradually acuminate, very stiffly coriaceous; calyx-teeth connate half-way; corolla-lobes very short, deltoid.....

A. adenobotrys Airy-Shaw

Flowers fascicled or solitary (peduncle obsolete):

Pedicels elongate, filiform, 1.5–2.3 cm. long; corolla subcampanulate, 5–7 mm. long; leaves very abruptly caudate.....

A. pilifera Hook. fil.

Pedicels less than 1.5 cm. long, rarely exceeding 1 cm.; corolla cylindric, at least 1 cm. long:

Leaves 4-11.5 cm. long, chartaceous ; bud-scales very large, lanceolate, up to 1.5 cm. long ; flowers fascicled ; pedicels up to 1 cm. long ; receptacle long-setose ; filaments glabrous.....*A. oblonga* Craib

Leaves mostly less than 4 cm. long, mostly coriaceous :

Flowers distinctly pedicellate (pedicel at least 5 mm. long) :

Leaf-base distinctly cuneate, lamina over 1.5 cm. long :

Anthers ecalcarate ; leaf-apex acute to subobtusate :

Leaves quite entire, acutely pungent-cuspidate ; corolla-lobes deltoid, 1-1.5 mm. long.....

A. Wardii W. W. Sm.

Leaves crenate-dentate towards subobtusate apex ;

corolla-lobes narrowly triangular, about 5 mm.

long..... *A. buxifolia* Nutt.

Anthers dorsally bicalcarate ; leaf-apex rounded or obtuse, rarely subacute :

Leaves narrowly elliptic-oblancheolate, 2.5-3 cm. long, 7-9 mm. broad, retuse ; receptacle densely cinereo-puberulous ; corolla up to 3.8 cm. long, externally minutely puberulous ; filaments glabrous.....*A. Kanjilali* A. Das

Leaves obovate (or, if narrowly oblancheolate, less than 6 mm. wide), obtuse or apiculate ; receptacle glabrous or sparingly and minutely puberulous ; corolla 0.5-2 cm. long ; filaments pubescent :

Leaves 7-22 mm. wide :

Leaves chartaceous to moderately coriaceous, oblancheolate to obovate, sometimes oblong-elliptic ; nerves reticulate, clearly visible ; corolla orange-red to crimson (Yunnan, Burma, Siam).....*A. Hosseana* Diels

Leaves very coriaceous, oblancheolate to obovate ; nerves immersed, very obscure ; corolla white (Yunnan)...*A. yunnanensis* Franch.

Leaves small, oblancheolate, 3-6 mm. wide (Khasia) :

Corolla cylindric, about 1.3 cm. long, greenish-white..... *A. Mannii* Hemsl.

Corolla short, subcampanulate (conical in bud), 5-8 mm. long, " pale reddish brown " (teste Hook.fil. in Herb. Kew.).....

A. obovata (Wight) Hook.fil.

Leaf-base rounded, lamina 1-1.5 cm. long, rigidly coriaceous, apex subacute ; flowers solitary or rarely 2 together ; pedicel setose and finely puberulous, 1.3-1.7 cm. long ; receptacle sparingly or densely setose or finely puberulous, or both, or glabrous ; filaments glabrous ; anthers ecalcarate.....

A. Lacei Craib

Flowers subsessile or very shortly pedicellate (pedicel rarely up to 4 mm. long), solitary; corolla pubescent outside; filaments pubescent; anthers bicalcarate:

Leaf-base cuneate, lamina narrowly obovate, shallowly crenulate-dentate above middle; nerves conspicuously elevate-reticulate above and below; receptacle shortly and finely pubescent.....*A. spissa* Airy-Shaw

Leaf-base rounded, lamina broadly ovate, entire; nerves obscure or impressed above; receptacle long-setose:

Leaves glabrous and almost shining beneath, over 1.5 cm. long and 1 cm. broad.....

A. brachypoda Airy-Shaw

Leaves shortly pilose beneath, up to about 1.5 cm. long and 1 cm. broad.....*A. pensilis* Airy-Shaw

Agapetes adenobotrys *Airy-Shaw*, sp. nov. ex affinitate *A. Pottingeri* Prain (e descriptione et icone), a qua foliis 4-4.5 cm. tantum longis nervis obscuris, racemo corymboso, bracteis ut videtur nullis sed bracteolis usque 4 mm. longis evolutis distinctissima; ab etiam affini *A. bracteata* Hook. f. ex C.B.Cl. (cuius folia simillima sed tenuiora) inflorescentia corymbosa, indole aliena bractearum et bracteolarum, calyce (ut in *A. Pottingeri*) tantum ad medium usque fisso, corollae lobis (sicut illius speciei) brevissimis statim distinguenda.

Frutex epiphyticus. *Rami* teretes, ut videtur anfractuosi, cortice pallide cinereo, iuniores parce longisetosi. *Folia* ovata, 4-4.5 cm. longa, 1.5-2 cm. lata, basi subrotundata, apice abruptiuscule caudato-acuminata, acutissima, integra, margine plana usque subrevoluta, glaberrima, crasse coriacea, olivacea, costa supra prominente infra inconspicua vix elevata, nervis supra parum elevatis infra valde obscuris; petiolus brevissimus vel subnullus. *Racemus* terminalis (? an semper), corymbosus, ima basi perulis paucis ovatis acutis fusco-brunneis suffultus, totus 6 cm. longus: axis 3.5 cm. longus, sat gracilis, subtiliter albo-puberulus pilis sparsis longis glandulosis intermixtis; pedicelli 1-1.5 cm. longi, sursum levissime ampliati, eodem modo ac pedunculus (axis) vestiti; bractea suffulciens ut videtur haud evoluta, saltem cito caduca nec in specimine suppetens; bracteolae tamen binae oppositae ima basi omnis pedicelli conspicuae, ovatae, acuminatae, 2-4 mm. longae, carinatae, castaneo-membranaceae, subtilissime ciliolatae. *Receptaculum* circiter 2 mm. longum et latum, indumento duplici densissime vestitum, pilis glanduliferis 1 mm. longis ut videtur roseis. *Calyx* (receptaculo excluso) 5-7 mm. longus, usque ad medium fissus, subtilissime albo-puberulus sed sine pilis glanduliferis, membranaceus, venosus, roseus, segmentis late subulatis acutis erectis. *Corolla* cylindrica, 2.1 cm. longa, 3-5 mm. diametro, crispule albo-pubescent, secus angulos glanduloso-pilosus, corallinus, lobis parvis deltoideis 1 mm. longis erectis ut videtur viridescens. *Stamina* tota circiter 1.9 cm. longa: filamenta

applanata, linearia, circiter 1·2 cm. longa, 0·5 mm. lata, glaberrima ; antherae anguste lineari-lanceolatae, 9–10 mm. longae, 2–3 mm. supra basin dorsifixae, minute papillosoe, dorso bicalcaratae, calcaribus plerumque altero sursum altero deorsum spectantibus 1 mm. longis gracilibus obscure vel vix scaberulis, rostris liberis. *Stylus* gracilis, fere 2 cm. longus, stigmate punctiformi. *Fructus* ignotus.

UPPER BURMA. Hills E. of the Nam Tisang, 1500–1800 m., 5 Jan. 1931, *F. Kingdon Ward* 9099 (type, Herb. Mus. Brit.) : “Epiphyte in the forest. Flowers crimson.”

A very distinct and in some respects anomalous species, unfortunately represented by rather scanty material consisting of a small leafy branchlet with one terminal inflorescence. Its affinities undoubtedly lie with *Agapetes Pottingeri* and *A. bracteata*, the flowers agreeing closely with those of the former (judging by the plate in Ann. Roy. Bot. Gard. Calc. 9 (1), t. 58 : 1901), whilst the leaves are almost indistinguishable in size and shape, though not in texture, from those of the latter. The form of the inflorescence—a corymb instead of an elongate raceme—and the development of the bracteoles, apparently at the expense of the bracts which are so conspicuous in the two species mentioned, are points of notable divergence.

Prain, when describing *A. Pottingeri* (Journ. As. Soc. Beng. 67 (2), 296 : 1898), constituted this species the type of a new section, *Holocalyx* Prain, distinguished by the large bracts and by the limb of the calyx not being divided to the base into five teeth. He appears to have overlooked, or been unaware of, *A. bracteata*, since he states that by the two characters mentioned his species is “separable from all hitherto described *Agapetes*.” The type of *A. Pottingeri*, presumably preserved in the Calcutta herbarium, is unfortunately not available for direct comparison but, as shown in the plate, the bracts appear very similar to those of *A. bracteata*. The latter species, however, breaks down the calyx character to which the section *Holocalyx* owes its name, for the calyx-segments are separate almost to the base, as in many other species of *Agapetes*. Brandis recognized the close relationship of these two species in his Indian Trees, 405 (1906).

The dense, almost setose, glandular covering of the receptacle in the present species (and also in *A. Pottingeri*) recalls the very similar, but eglandular, indumentum of *A. oblonga* Craib. Calyx, corolla and androecium, indeed, are so very alike in these three species, and the leaf-shape, texture and nervation in *A. Pottingeri* and *A. oblonga*, that, in spite of considerable divergences in certain points, the conclusion that real affinity is involved is irresistible. An instructive inflorescence-series can be drawn up from these species, as follows :—

A. bracteata : elongate, bracteate raceme ; calyx and corolla deeply divided.

A. Pottingeri : subcorymbose, bracteate raceme ; calyx and corolla-lobes very short.

A. adenobotrys : corymb, ebracteate or bracts early deciduous ; perianth as above.

A. oblonga : fascicle, few- to many-flowered ; bracts early deciduous ; perianth as above.

The final stage in the evolution of the inflorescence of this series is the reduction of the fascicle to a solitary subsessile flower, as in certain species described below (see pp. 49-53).

In the reverse direction it is easy to go further back than *A. bracteata*. A short and obvious step leads to *Vaccinium Dunalianum* Wight and its allies—*V. camphorifolium* Hand.-Mazz., *V. urceolatum* Hemsl., *V. caudatifolium* Hayata (if indeed these three are really distinct from *V. Dunalianum*) and *V. arbutoides* C.B.Cl. [*V. gaultheriifolium* Hook. f. and *V. glauco-album* Hook. f., through sandwiched between *V. Dunalianum* and *V. arbutoides* in the "Flora of British India," are not closely allied to them ; C. B. Clarke's arrangement is misleading in this respect]. Probably Dunn's *Agapetes parviflora* and *A. vaccinioides* also are not distantly related. In all these species, however, the bracts are deciduous. *Vaccinium bracteatum* Thunb. and its allies, in which the bracts are persistent as in *Agapetes bracteata*, belong to a very different circle of affinity.

The above considerations seem to afford strong evidence of the artificiality of *Vaccinium*, Sect. *Epigynium*, and *Agapetes*, at least as at present circumscribed.

Agapetes pilifera Hook. fil. ex C. B. Clarke in Hook. fil. Fl. Brit. Ind. 3, 448 (1881) ; Brandis, Ind. Trees, 405 (1906).

UPPER BURMA. Nam Tamai valley, 1200-1500 m., 22 Jan. 1931, F. Kingdon Ward 9154 (Herb. Mus. Brit.) : "A small tree or large epiphytic shrub, in the open forest. Flowers more or less green, rosy on one side, practically over. Ripe berries black."

The ripe fruits, not previously collected, are globose, about 5 mm. in diameter.

This curious and anomalous species, which might almost constitute a distinct genus, was probably rightly associated by C. B. Clarke with *A. bracteata* Hook. f., an affinity which is supported both by the leaf-shape (abruptly caudate-attenuate) and the glandular-hairy pedicels. The small, subcampanulate corollas are so similar to those of *Vaccinium Dunalianum* Wight and its allies that it might with almost equal justice be placed in that genus ; the fasciculate inflorescence and elongate pedicels however, would create an even greater anomaly in *Vaccinium* than is now occasioned in *Agapetes* by the "vaccinioid" corolla. [Cf. *A. acuminata* (p. 25) and *A. obovata* (pp. 26, 45).]

Agapetes oblonga Craib in Bull. Misc. Inf. Kew, 1913, 43 ; W.E. Evans in Notes Roy. Bot. Gard. Edinb. 15, 204 (1927).

UPPER BURMA. Seinghku Wang, 1500–1650 m., 15 May 1926, *F. Kingdon Ward* 6710 (Herb. Kew.): “Epiphyte, with long limp branches which hang down many feet, over the river or elsewhere. Flowers scarlet, with a green rim. The young fruit is bearded with long crimson hairs.” Nam Tamai valley, 1200–1500 m., 15 Jan. 1931, *F. Kingdon Ward* 9145 (Herb. Mus. Brit.): “Epiphyte in the forest. Flowers crimson, hardly open. Common. (Also in Assam).”

Ward’s no. 9145 brings the maximum leaf-measurements from 9.5 by 3.5 cm., found by Evans for Forrest’s and Farrer’s specimens, up to 11.5 by 4.5 cm. These large-leaved forms are, as noted under *A. adenobotrys* (p. 47, *supra*), very similar to *A. Pottingeri*.

Agapetes Kanjilali *A. Das* in Assam Forest Records (Botany), 1, 13, t. 6 (1934); Airy-Shaw in Hook. Ic. Pl. 33, t. 3255 (1935), *ined.*

ASSAM. Lakhimpur Distr.: Makum Range, 105 m., April 1914, *Upendranath Kanjilal* 4090 (type number): “Epiphytic. Corolla not transversely marked.”

Vernacular name (Assam): *Horu Gumani*.

The above specimen came into the possession of the Kew Herbarium with the herbarium of the late J. S. Gamble and is doubtless the one referred to by Das (*l.c.* 14) as having been sent to Gamble by Rai Bahadur. On the sheet is written in Gamble’s handwriting: “near *A. yunnanensis* Franch. [and] *A. Hosseana* Diels but doesn’t quite suit either,” and in a capsule attached to the sheet is a carefully dissected flower and a drawing of a stamen, $\times 2$, dated 24-12-14, the year in which the specimen was collected. Gamble’s suggestion as to the affinity of this species is certainly correct, but the differences are much greater than his “doesn’t quite suit” would indicate. The flowers are about twice as large, and the great length of the filaments, which are glabrous, not pubescent, is unique in the genus. The apparently coalescent beaks of the anthers are also a peculiar feature.

Agapetes spissa *Airy-Shaw*, sp. nov., habitu atque foliorum figura *A. Wardii* W. W. Sm. accedens, a qua tamen calycis hirsuti segmentis brevibus, corolla pubescente et foliis denticulatis (nec integerrimis) recedit; ex affinitate proxima *A. pensilis* Airy-Shaw et *A. brachypodae* Airy-Shaw (*vide infra*), a quibus differt caulibus rigidis creberrime verticillato-ramificatis, foliis obovatis crenulato-denticulatis basi cuneatis nervis utrinque pulchre prominenter reticulatis differt.

Suffrutex parvus, epiphyticus. *Caules* robusti, rigidi, dense ramosi, usque 5 mm. crassi, cortice fusco-brunneo longitudinaliter striato lenticellis parvis pallidis rotundis vel lateraliter elongatis parce notato; rami miro modo verticillati vel subverticillati, usque 10 ex eodem loco ut videtur nascentes, rigidi, recti, patuli, foliosis-

simi, dense patenti-hirsuti, perulis lineari-lanceolatis 5–10 cm. longis membranaceis brunneis vel eorum vestigiis emarcidis etiam crebre vestiti; innovationes longe ferrugineo-hirsuti. *Folia* obovata, rarius subelliptica, 2–2.5 cm. longa, 7–10 mm. lata, in petiolum brevissimum cuneato-angustata, apice subacuta usque subobtusata, margine subrevoluta crenulato-denticulata denticulis minute apiculatis, basin versus subintegra, glaberrima, supra nitida siccitate surde fusco-viridia, subtus obscuriora pallidiora (innovationum subpurpurascencia); costa et nervi utrinque pulchre prominenter reticulati, intra marginem anastomosantes; petiolus subnullus. *Flores* solitarii, axillares, pedicello circiter 2 mm. longo basi perulis vel bracteolis paucis minutis instructo. *Receptaculum* obconicum, pedicello distincte articulatum, 2–3 mm. diametro, subtiliter pubescens. *Calycis segmenta* breviter connata, ovato-triangularia, subacuminata, acuta, 2–3 mm. longa, 1.5 mm. lata, extra parce breviter pubescentia. *Corolla* subcylindrica, apicem versus leviter angustata, 5-angulata, tenera, alba, tubo 1 cm. longo 3–4 mm. lato extra minutissime puberulo et insuper secus angulos breviter glanduloso-pubescente, intus (maxime superne) minute pubescente, segmentis deltoideis acutis patenti-recurvis 1 mm. longis glabrescentibus. *Filamenta* angustissime linearia, applanata, 3–4 mm. longa, vix 0.3 mm. lata, crispule pubescentia, basi in dilatationem rotundato-quadratam circiter 0.6 mm. diametro subito expansa. *Antherae* leviter cohaerentes, anguste lanceolatae, 5 mm. longae, filamento dorsaliter basifixae eique 1 mm. adnatae, thecis basi rotundatis et brevissime cornutis, rostris tenerrimis flexilibus ut videtur planis dorso calcaratis, antherarum alternarum calcaribus adscendentibus et deflexis minutissime vel vix papilloso-scaberulis. *Stylus* filiformis, 9–10 mm. longus, glaber, stigmatibus parvo subdisciformi pallido medio depresso. *Fructus* ignotus.—*Vide* Hook. Ic. Pl. 33, t. 3258 (1935), *ined.*

ASSAM. Delei valley, 28° 20' N., 96° 35' E., 1500–1800 m., 24 July 1928, *F. Kingdon Ward* 8479 (type, Herb. Kew.): "A small epiphytic undershrub in the forest. Flowers white. Calyx, corolla and filaments pubescent or downy."

The verticillate branching of this species, resulting in a densely bushy habit, is unique in the genus. The fine elevate reticulation of the veins on both surfaces of the leaves is remarkably pretty.

A new type in the Series is represented by this and the next two species (which are not closely related to any hitherto described), for the rather small, pubescent, solitary or subsolitary flowers are so shortly pedicelled as to appear sessile. If the corollas were as reduced in size as they are in *A. pilifera* or *A. obovata*, one might regard the result as the climax of reduction within the genus, and it may well be that further exploration of the prolific regions of Upper Burma and Assam will bring such a hypothetical form to light. It is possible, however, that the combination of a short corolla with a very short pedicel might be a disadvantageous one

and therefore unlikely to survive even if ever evolved, since it is noteworthy that the above-mentioned two species, which are anomalous in the possession of a much reduced corolla, have relatively very long pedicels. One may surmise that there is some biological significance in this fact, perhaps in connection with pollination: field-observations on the type of insect-visitor frequenting the flowers would therefore be of considerable interest.

Agapetes brachypoda *Airy-Shaw*, sp. nov., ab *A. spissa* *Airy-Shaw* foliis late ovatis integris utrinque subrotundatis, nervis supra impressis infra obscuris, receptaculo longe setoso, ab *A. pensili* *Airy-Shaw* (*vide infra*) ramis robustis parum ramosis, foliis fere duplo maioribus crassius coriaceis glaberrimis distincta.

Suffrutex parvus, patulus, interdum epiphyticus. *Rami* robusti, recti, subsimplices, usque 5 mm. diametro, dense patenti-hirsuti, innovationibus ferrugineo-hirtis. *Folia* breviter ovata usque elliptica, 1.5-2.1 cm. longa, 1-1.5 cm. lata, basi subcuneata usque rotundata, apice rotundata, apiculata, margine revoluta integerrimo vel hinc inde cilio vel vestigio denticuli minuti interrupto, crasse rigide coriacea, glaberrima, siccitate pagina superiore rugulosa, cinereo-viridia, pagina inferiore laevia, laete brunnescentia; costa et nervi supra impressi, subtus prominuli; petiolus brevissimus, 1-2 mm. longus, transverse rugosus, basi perulis lineari-subulatis setiformibus usque 3 mm. longis quasi stipulis laciniatis circumdatus; folia innovationum coccinea (teste Ward), siccitate surde rosea, margine revoluta remote ciliata. *Flores* axillares, solitarii vel bini, penduli, brevissime pedicellati; pedicelli breviter albo-pubescentes et longe subferrugineo-glanduloso-setosi, 2-4 mm. longi, paullulum supra basin bracteolis binis ovatis acutis ciliolatis et ipsa basi perulis paucis parvis brunneis membranaceis ciliolatis suffulti. *Receptaculum* obconicum, eodem modo ac pedicellus dense vestitum, 2-4 mm. diametro. *Calycis* segmenta ovato-lanceolata, 4-6 mm. longa, basi circiter 2 mm. lata, breviter acuminata, acuta, submembranacea, nervosa, indumento duplici parce vestita. *Corolla* fere stricte cylindrica, inferne levissime ampliata, alba, tenuiter roseo-vittata, tubo 1.6-1.7 cm. longo 5-6 mm. lato extra indumento duplici breviter pubescente intus basin versus parce breviter et subtiliter pubescente, segmentis triangularibus reflexis 1-2 mm. longis acutis intus minute papillosis marginibus glabrescentibus. *Filamenta* linearia, applanata, 1.3 cm. longa, 0.5 mm. lata, copiose pubescentia, basi vel paullo supra basin in dilatationem oblongam 2 mm. longam 1 mm. latam glabram abruptiuscule ampliata. *Antherae* leviter cohaerentes, anguste oblongo-lanceolatae, filamentum dorsaliter basifixae eique 2-3 mm. adnatae, 6 mm. longae, vix 1 mm. latae, rostris liberis apicem versus attenuatis rigidis parte pollinifera brevioribus (2.5: 3.5 mm.), dorso supra medium calcaribus duobus papilloso-scabridis iis *A. pensilis* simillimis instructae. *Stylus* filiformis, 1.7 cm. longus, glaber, stigmatibus minutis vix expanso. *Fructus* ignotus.—*Vide* Hook. Ic. Pl. 33, t. 3257 (1935), *ined.*

UPPER BURMA. Mountains, east of Fort Hertz, 27° 30' N., 97° 50' E., 1800 m., 5 Sept. 1926, *F. Kingdon Ward* 7369 (type, Herb. Kew.): "Small spreading undershrub on rocks or trees; young foliage scarlet. Flowers white, with thin pale pink stripes."

In habit and foliage very unlike the last, in floral characters very similar, but possessing long gland-tipped hairs, in addition to the short simple pubescence, on the pedicel and calyx, as in the next species.

Agapetes pensilis *Airy-Shaw*, sp. nov. *A. brachypodae* Airy-Shaw affinis, sed multo gracilior, foliis fere duplo minoribus saltem infra breviter pilosis.

Suffrutex epiphyticus, scandens, a ramis arborum longe pendulus, ramosissimus. *Caules* graciles, 1–2 mm. crassi (vetustiores usque 3 mm.), dense et longiuscule brunneo-pilosi, e parte basali radices napelliformes usque 3.5 cm. longas emittentes. *Folia* parva, ovata usque elliptico-oblonga, 1–1.6 cm. longa, 0.5–1.1 cm. lata, basi angustato-rotundata, apice obtusa usque subacuta, apiculata, margine integerrimo leviter revoluta pauciciliata vel fere eciliata, utraque pagina pilis paucis brevibus aegre visibilibus conspersa (sed folia innovationum plus minus dense pubescentia), siccitate supra surde viridia, rugulosa, subtus pallidiora, plana, coriacea, costa et nervis supra impressis subtus obscurissimis; petiolus vix 1 mm. longus vel subnullus. *Flores* solitarii vel bini, ut videtur parcellissime editi, subsessiles, pedicello 1–2 mm. longo. *Receptaculum* turbina-tum, circiter 2 mm. diametro et aequilongum, totum longe ac dense setoso-pilosum. *Calycis* segmenta sublibera, ovato-deltoidea, circiter 2 mm. longa et basi subaequilata, subacuminata, acuta, dorso longe pilosa sed minus dense ac receptaculum. *Corolla* cylindrica, sursum levissime angustata, tubo 1.7 cm. longo 5–7 mm. diametro albo- et roseo-vittato, segmentis deltoideis viridibus circiter 1.5 mm. longis et basi aequilatis acutis recurvis apice ipso iterum recurvo, extra longiuscule et densiuscule glanduloso-pilosa, pilis albis 1–1.5 mm. longis, glandulis fuscis oblongis, fauce breviter et sparsius eglanduloso-piloso. *Filamenta* libera, lineari-subulata, basi leviter dilatata, plana, circiter 12 mm. longa et 0.5 mm. lata, pilosa. *Antherae* leviter cohaerentes, anguste lanceolatae, 6 mm. longae, filamentis subaequilatae, circiter 1 mm. supra basin rotundatam dorsifixae, rostris liberis apicem versus subattenuatis rigidis parte pollinifera paullo longioribus subobtusis poro oblongo dehiscentibus, medio dorso calcaribus duobus papilloso-scabridis angulo recto porrectis angulo recto iterum sursum refractis totis circiter 1.5 mm. longis instructae, antherarum alternarum calcaribus porrectioribus. *Stylus* filiformis, 1.7 cm. longus, glaber, stigmate truncato obscure denticulato vix expanso. *Fructus* ignotus.—*Vide* Hook. Ic. Pl. 33, t. 3256 (1935), *ined.*

UPPER BURMA. Valley of the Seinghku, 28° 5' N., 97° 30' E., 2400–2700 m., 25 Sept. 1926, *F. Kingdon Ward* 7458 (type, Herb.

Kew.): "A pendent epiphyte in the upper rain forest, hanging from the boughs of large trees by the yard, or curtaining their trunks. Flowers striped pink and white with a green toothed rim. Small carrot-like water-storing tubers occur at the base, but these are very small compared with the large globular structures found on other species which grow in parts of Burma where there is a long dry season."

N. W. YUNNAN. Prope fines Tibeto-Birmanicas inter fluvios Lu-djiang (Salween) et Djiou-djiang (Irrawadi or. sup.), in jugi Tschiangschel, 27° 52', lateris occid. pluviisilva mixta temperata, substr. granitico, circiter 2800-3450 m., 5 Jul. 1916, *Handel-Mazzetti* 9352: "Frutex epiphyticus pendulus bulbos lignosos edens."

Closely allied to *A. brachypoda*, but the slender, pendent habit, and the much smaller, less coriaceous leaves, pubescent below, at once distinguish it. Dr. Handel-Mazzetti's discovery of the species in the adjacent part of Yunnan is interesting, since it indicates that some of these apparently local species may be much more widely distributed.

Agapetes sp. nov. (material insufficient for description).

ASSAM. Delei Valley, 28° 15' N., 96° 35' E., 2100-2700 m., 25 Aug. 1928, *F. Kingdon Ward* 8585 (Herb. Kew.): "A small straggling epiphytic undershrub of the forest, southern slope. In fruit."

The hirsute branches, small leaves and solitary subsessile flowers clearly place this in the neighbourhood of *A. pensilis*, *A. brachypoda* and *A. spissa*, from all of which it differs in the much thinner texture of its ovate-oblong leaves.

NUMERICAL LIST OF AGAPETES COLLECTED BY CAPT. F. KINGDON WARD, 1924-1931.

6323.	<i>praeclara</i>	8124.	<i>burmanica</i>
6710.	<i>oblonga</i>	8479.	<i>spissa</i>
6749.	<i>Forrestii</i>	8585.	sp. aff. <i>pensilis</i> , etc.
7369.	<i>brachypoda</i>	9099.	<i>adenobotrys</i>
7458.	<i>pensilis</i>	9101.	<i>pseudo-Griffithii</i>
7788.	<i>Lobbii</i>	9118.	<i>pubiflora</i>
7791.	<i>Parishii</i>	9144.	<i>pseudo-Griffithii</i>
7977.	sp. aff. <i>salicifolia</i>	9145.	<i>oblonga</i>
8021.	<i>linearifolia</i>	9153.	<i>angulata</i>
8032.	<i>macrophylla</i>	9154.	<i>pilifera</i>
8061.	<i>Forrestii</i>	10168.	<i>pubiflora</i>

III.—ON THE FLORA OF THE NEARER EAST: XVI*

MISCELLANEOUS NEW RECORDS. W. B. TURRILL.

***Oxytropis thessala* Turrill.**

In the Kew Bulletin, 1930, 122, a new species of *Oxytropis* was described, from material collected by Dr. P. L. Giuseppi from the Thessalian Olympus, under the name *Oxytropis olympica*. Unfortunately, St. John, in Proc. Biol. Soc. Wash. **41**, 103 (1928), used the name *O. olympica* for a plant from the Olympic Mountains, Washington, U.S.A. At the time the description of the Thessalian plant was prepared St. John's name had not been included for the Index Kewensis supplement then in preparation. The name *Oxytropis thessala* Turrill is herewith proposed in place of *O. olympica* Turrill non St. John.

***Geum heterocarpum* Boiss. in Albania.**

In his Elenchus plantarum novarum minusque cognitarum, 40 (1838) Boissier describes *G. heterocarpum* from Sierra Tejada et Nevada. In his Voyage Botanique dans l'Espagne, 201, t.58 (1839-45) he gives the species as occurring "in dumetis umbrosis praecipuè Berberidis Creticae in regione alpinâ, Sierra Tejada, Sierra de la Nieve, Sierra Nevada en la Cartejuela. Alt. 5000'-6000'. Fl. Jun.-Jul." with "Hab. in Hispaniâ australi, monte Tauro Asiae minoris (Aucher)." In the "Additions et Corrections" of the same work, p. 728, he records finding the same species on the most eastern summit of Cadmus in Caria. He notes that in this material the carpels are situated together in one group, not one sessile in the calyx and the others on a "stipe," and therefore changes the name *G. heterocarpum* to *G. umbrosum*. In the Flor. Or. **2**, 698 (1872) he reverts to the name *G. heterocarpum*, which is also the correct name under the present International Rules. The species also occurs in (1) W. Algeria (Dj. Morghad), E. Algeria (Touggour), and Morocco (Immouzer, Ari Benji, Aguelman-Sidi-Ali-in-Mohand)—Maire, Catalogue des Plantes du Maroc, **2**, 338 (1932); (2) Dauphiné ("sous les roches calcaires de la Corniche du mont Seüse près de Gap," Rouy et Fouc. Flor. de France **6**, 158: 1900); (3) Italy, Lucania, according to Bolle in Fedde Repert. Beih. **72**, 44 (1933); (4) Orient: Caria, Lycia, Phrygia, Cilicia, Cappadocia, Syria, Palestine, Iraq, W. Persia, Armenia, and Transcaspia.

G. heterocarpum is the type species of the section *Orthostylus* Fisch. et Mey. (sect. *Orthurus* Boiss.) which was raised to the rank of a subgenus by Bolle (l.c. 43). Within the same section or subgenus are included *G. speciosum* N. Alboff from the western Caucasus (Abchasia, Mingrelia), and *G. kokanicum* Regel et Schmalhausen from Central Asia (Kokania) and N. Persia (see Bornmüller in Mitt. Bot. Thür Ver. **21**, 61: 1906).

*Continued from K.B., 1934.

The wide but discontinuous distribution of *G. heterocarpum* is a reason for supposing it to be an old relict type in the Mediterranean Region, since its occurrence at high elevations, up to 2000 m., makes it most improbable that it was accidentally introduced in recent times. Its discovery by Alston and Sandwith in the Balkan Peninsula, an area rich in Tertiary relicts, is thus of more than passing interest. In their 1933 visit to South Albania, Alston and Sandwith collected the species in the district of Gjinokastrë (Argirokastron) on the Strakavec peak of the Mali Lunxheriës range above Çajup, under a juniper bush on limestone, at 1700 m., on 13.6.1933, with pale yellow flowers, No. 1663, and from exactly the same locality in young fruit, on 12.7.1933, No. 2209.

Another matter of considerable interest is the intra-specific variation of *G. heterocarpum*. The Spanish material is fairly uniform, certainly much more so than the Oriental. On the whole it has smaller flowers, less spreading carpel indumentum, relatively longer gynophore and more marked "heterocarpy" than eastern specimens. The Albanian plants agree best with much Asiatic material, but it must be noted that some specimens from the east agree in flower size and indumentum with the Spanish plants. It may be suggested that there is here another example of a plant of eastern origin which during or after its spread westwards lost some of its genetic variability, i.e. the isolated populations of the west have a smaller gene content than the more polymorphic population of the Orient. Other explanations of the known facts are, of course, possible, and only the examination of much more material than is at present available can prove which is correct. Throughout its range *G. heterocarpum* seems to occur in the shade of shrubs or brushwood (*Berberis*, *Juniperis*) especially, if not entirely, on limestone.

Sideritis perfoliata L. Sp. Pl. 575 (1753) var. **lanata** Turriil a planta typica caulibus folisque villosulo-lanatis praecipue differt.

Caulis dense villosulo-lanatus et pilis brevioribus glandulosis praeditus, internodiis 1.5–2.3 cm. longis. *Folia* caulina anguste oblonga, 4–5 cm. longa, 1.2–1.5 cm. lata, acuta, basi rotundata, sessilia vel brevissime et abrupte vel subabrupte petiolata, margine inconspicue dentato-crenulata, untrinque dense albo-lanata; floralia inferiora foliis subsimilia sed breviora latioraque, superiora a basi latissima ovata contracta, longe acuminata, apice fere spinulosa, circiter 3 cm. longa et 3 cm. lata, reticulato-venosa, flavido-viridia. *Calyx* 1.1 cm. longus, tubo cylindrico 7 mm. longo glanduloso-hispidulo, dentibus anguste triangulari-lanceolatis acuminatis 4 mm. longis longe hirsuto-barbatis. *Corolla* 11.5 mm. longa, extus superne hirsuta, inferne glabrescens, tubo basi 2 mm. fauce fere 4 mm. diametro, labio adaxiale bilobato lobis oblongis 3.5 mm. longis 1.75 mm. latis, labio abaxiale trilobato lobis lateralibus ovatis 2 mm. longis 1.5 mm. latis intermedio 2 mm. longo 3 mm. lato, lobis omnibus utrinque hispidulo-hirsutis. *Stamina* 2.5 mm.

longa, filamentis glabris. *Stylus* (stigmatibus inclusis) 5.5 mm. longus, glaber, ramis stigmaticis inaequalibus 1.0 et 1.3 mm. longis, concavis truncatis, ramo inferiore superiorem amplectente; ovarium 1.25 mm. altum.

SAMOTHRACE: Mt. Fengari, 1550 m., rather flat places on summit of ridge, and occasionally on rough stony slope, not common, *H. G. Tedd* 1473.

Sideritis perfoliata L. is described (Sp. Pl. 575: 1753) as "herbacea hispido-pilosa, foliis superioribus amplexicaulibus" with a subsidiary description which with the reference to Royen can leave little doubt that the Asia Minor plants named *S. perfoliata* at Kew really represent the species as intended by Linnaeus. Royen's synonyms, however, remain doubtful, especially the second, and Linnaeus describes the corallas as "albae venis aliquot rufis." The species in the sense accepted here occurs with a fairly wide distribution in western and southern Asia Minor, Syria, Palestine, the Athos Peninsula, and Samothrace. In general as traced from south to north it becomes increasingly lanate and the Samothrace plant is better considered as the final item of a series than as a sharply marked variety. The inflorescence leaves (i.e. those subtending the flower groups) particularly are much more lanate in the Samothrace plant, and to a slightly less degree in the Athos material, than in the Asia Minor, Syrian, and Palestine specimens. On the whole also the northern material shows a less marked distinction between the lower cauline and the inflorescence leaves. With increased indumentum the shortly stalked glands are much hidden on all the leaves and the stems.

Halácsy, Consp. Flor. Graec. 2, 497 (1902), records *S. perfoliata* from Thessalia: mt. Agrapha in Pindo (Heldr.) and quotes *S. pindicola* Heldr. in delt. syllog. Parn. 1900, 4. It has not been possible to see either the specimen or the publication and the Thessalian plant remains doubtful. Maire (Quatr. Fasc. Étude Pl. Vasc. Grèce, Nancy 1908, 173) also records *S. perfoliata* from the Pindus—"mont Neraïdha, audessus de Grevenoseli, calcaire, 1200-1600 m., ?Recueilli par les indigènes pour faire des infusions théiformes, no. 1940." Hayek, Prodr. Flor. Penins. Balc. 2, 257 (1929) does not account for the name *Sideritis pindicola* and records *S. perfoliata* L. only for Macedonia, presumably on the Athos specimens.

The first identification of the Athos plant as *S. perfoliata* was apparently made by Grisebach, Reise durch Rumel. u. nach Brussa, 1, 239 (1841) and Spic. 2, 144 (1844) on material collected by Friedrichsthal and preserved at Vienna. Specimens from the Athos Peninsula are at Kew, collected by Sintensis and Bornmüller 945 (1891) and by Adamović (1903). It is interesting to note that the latter were named by the collector *Sideritis athoa* Adamov., which remains apparently an unpublished manuscript name. The Athos specimens at Kew are nearly as lanate as the Samothrace specimens

and the study of more material from both localities might enable the north Aegean plants to be more definitely separated from those of Asia Minor as one variety. On the other hand, additional specimens from Asia Minor might make the known series still more continuous than it is at present.

S. clandestina was first described by Chaubard et Bory (Expéd. scient. de Morée, 170, t.20 : 1832) under the name *Phlomis clandestina*. The original material came from "des hautes régions du Taygète, où il nous a paru rare, et d'où l'a rapporté M. Virlet lors de sa dernière ascension par les pentes orientales." The plate is reproduced in their Flor. peloponn. 36, t.21 (1838) with the name *Sideritis syriaca* L. but this is not the Linnean *S. syriaca*, which is a Cretan plant. Boissier and Heldreich in Boiss. Diagn. Ser. 1, 7, 58 (1846), published the name *Sideritis theezans* with a description of the same species, and in Diagn. ser. 2, 4, 32 (1859) they published *S. peloponnesiaca* as a species. The latter is now generally, and probably correctly, regarded as a variety of *S. clandestina*. Hayek Prodr. Flor. Penins. Balc. 2, 257 (1929), correctly according to the International Rules, made the combination *S. clandestina* (Chaub. et Bory) Hayek. The known geographical distribution of *S. clandestina* is Laconia : mt. Malevo, Taygetos and of the var. *cyllenea* (Boiss.) Hayek, Achaia : mt. Kyllene ; mt. Chelmos ; Elis : mt. Olenos ; Argolis : mt. Artemision. In addition Degen, in Oesterr. Bot. Zeitschr. 16, 304, 337 (1891) has recorded the species (as *S. theezans*) from Samothrace. Degen's material has not been seen but it may be suggested that it is probably *S. perfoliata* var. *lanata*. His reference to the plant in the interpolated phrase "mit einer dicht wollig bekleideten, gelbblühenden Pflanze" supports the standpoint taken here. The Samothrace plant as represented by Tedd's material differs from *S. clandestina* in the longer lanate indumentum, in the shorter internodes of the flowering stems, in the sessile or very shortly petiolate leaves which are generally shorter or broader or both, the smaller flowers, and the glandulose hispidulous calyx-tube.

S. scardica Griseb. has been fully considered in Hooker's Icones Plantarum, t.3157 (1932). With the present distribution of the mainland around the northern part of the Aegean Sea it is approximately intermediate in geographical distribution between *S. clandestina* and *S. perfoliata*, except for Halácsy's and Maire's records of the latter species from the Pindus.

IV—MISCELLANEOUS NOTES.

Royal Horticultural Society Honours to Kewites.—The following Kewites appear in the recently published list of Royal Horticultural Society honours :—

Victoria Medal of Honour.—Sir Arthur W. Hill, K.C.M.G., F.R.S., Director, Royal Botanic Gardens, Kew ; Mr. W. Hales, A.L.S., Curator, Physic Garden, Chelsea.

Associateship of Honour.—Mr. S. W. McLeod Braggins, Superintendent, La Mortola, Italy; Mr. C. P. Raffill, Assistant Curator, Royal Botanic Gardens, Kew.

NICHOLAS EDWARD BROWN.—Dr. N. E. Brown was born at Redhill, Surrey, on July 11th, 1849. He died peacefully on November 25th, 1934, at his residence in The Avenue, Kew Gardens, after a few months' illness, retaining all his faculties to the last. He was buried at Richmond Cemetery on November 29th in the presence of many of his former colleagues and friends.

Brown was educated at the Grammar School at Reigate, and on leaving was employed by Mr. William Wilson Saunders, F.R.S., F.L.S., to act as Curator of his museum in the same town. At that time Mr. Saunders was one of the leading naturalists in England, and a most liberal amateur horticulturist. He produced and edited the *Refugium Botanicum*, or "Figures and Descriptions, from living specimens, of Little Known or New Plants of Botanical Interest." This work ran into five volumes, from 1869 to 1873, and was devoted chiefly to succulent plants generally, bulbous plants of various families, Orchids, Aroids, Bromeliads, *Geraniaceae*, etc., the very plants in which Brown ever afterwards retained a keen interest and on which he was regarded as the chief authority. These volumes appeared during Brown's curatorship of Mr. Saunders' museum, and it was natural that so promising a botanist as he must have then shown himself to be should migrate to Kew, for Mr. Saunders had enlisted the help of Mr. J. G. Baker and Mr. W. H. Fitch, who were responsible for the descriptions, and for the figures and dissections respectively, whilst the celebrated orchid specialist of the day, Professor H. G. Reichenbach, of Hamburg, contributed the accounts of the orchids. Thus Brown had the great advantage, at the threshold of his career, of being closely associated with the leading botanists of the time. That he retained a lively interest in these five volumes of his employer seems clear, for his pencil emendations are numerous on the Kew copy, which no doubt explains why Reichenbach used to speak of him as his "lynx-eyed little friend."

In February 1873 Brown, at the age of 24, was appointed Assistant in the Herbarium at Kew, and, although of poor physique and often in indifferent health, he has outlived all his colleagues of that time. In 1874 he commenced lecturing on geographical botany, which brought him into contact with successive generations of student-gardeners, and it is in this connection that many such remember him best. His portrait appeared in the Kew Guild Journal for 1904. Horticulture, as well as botany, owes a good deal to Brown. From 1876 to 1886 he compiled the annual lists of new plants in "Hogg's Gardeners' Year Book," and when that publication ceased he prepared similar lists for the "Kew Bulletin," a task later handed on to his colleague, Mr. S. A. Skan. He was concerned

with the compilation of that useful work, "Johnson's Gardeners' Dictionary," and during nearly the whole of his life was a valued contributor to the "Gardeners' Chronicle."

Brown's contributions to botany were many and varied. In 1886 he completed the last volume (vol. 12) of Syme's "English Botany," some of the plates being from his own brush, and he published a supplement to vols. 1-4 in 1892. After this his official duties diverted his energies into tropical botany. He became intensely interested in the floras of Tropical and South Africa, especially the latter, and he possessed an unrivalled knowledge of the geography of Africa. He checked the whole of the records of localities after the resuscitation of the "Flora of Tropical Africa" and the "Flora Capensis" under the editorship of Sir William Thiselton-Dyer, his help being gratefully acknowledged in the preface to each volume.

In 1892 he contributed his first description to the *Decades Kewenses* and to the *Diagnoses Africanæ*, under the titles of which he has published descriptions of very many new species. Most of the papers in the early volumes of the "Kew Bulletin" were unsigned, but Brown's name appeared in 1894 with an account of "Tuberous Labiatae." From 1896 to the time of his retirement in 1914 Brown was occupied mainly with the flora of Africa. Besides checking the geographical records mentioned above, he elaborated some of the most difficult families. He did a portion of the *Orchidaceae* for vol. 7 (1898) of the "Flora of Tropical Africa," and for the remainder of that work the following families, most of them entailing much laborious and careful dissection: *Pontederiaceae*, *Xyridaceae*, *Typhaceae*, *Araceae*, *Eriocaulaceae*, *Mayacaceae*, *Asclepiadaceae*, *Gentianaceae* (with J. G. Baker), and for vol. 6 the troublesome genus *Euphorbia*, his account of this occupying 158 pages. With reference to this the editor says in the preface "Mr. N. E. Brown, A.L.S., who finds a peculiar fascination in the study of succulent plants, the difficulties of which most botanists find deterrent, undertook the genus *Euphorbia*." His most important separate paper on the African flora was his "List of Plants collected in Ngamiland and Northern Kalahari Desert by Major E. J. Lugard, D.S.O." (*K.B.* 1909, 89-146), most of his determinations having stood the test of time and revision.

In 1915 he published in the Kew Bulletin a valuable monograph of all the known species of *Sansevieria*, and the year before that "Notes on the genera *Cordyline*, *Dracaena*, *Pleomele*, *Sansevieria* and *Taetsia*."

Without Brown's help the "Flora Capensis" might even now be unfinished, for he contributed very largely to its pages. In vol. 7 he described the same monocotyledonous families as he had done for the Tropical Flora; for vol. 5, pt. 1, he did part of the *Labiatae*; for vol. 4, pt. 1, the *Asclepiadaceae* (occupying 518 pages), and the smaller genera of *Ericaceae* (103 pages); and in addition he helped

to complete the account of *Erica* by Guthrie and Bolus, the former dying during its preparation, and the latter having to give up the work owing to indifferent health. At the close of his official connection with Kew, Brown worked out the genus *Euphorbia* (155 pages) and the family *Urticaceae* for the same Flora. His contributions to our knowledge of all these intricate families may be described as models of critical and thorough work.

Brown was also entrusted with the enumeration of the very important collection of plants made on Mt. Roraima in British Guiana by McConnell and Quelch (Trans. Linn. Soc. ser. 2, 6, 18-107, with 14 plates, the analyses by N. E. Brown), and after his retirement worked out some South American collections for the New York Botanical Garden.

Of late years Brown made a critical study of the large genus *Mesembryanthemum*, and has divided it into a very great and perhaps excessive number of smaller genera, published mainly in the "Gardeners' Chronicle." He also collaborated with A. Tischer and M. C. Karsten in producing a book entitled "*Mesembryanthema*," with descriptions in English, German and Dutch, and edited by E. J. Labarre (L. Reeve & Co., 1931). He grew many of these plants in his small greenhouse, and it is satisfactory to record that they have now been added to the Kew collection. He assisted Dr. Burt Davy with portions of the "Flora of the Transvaal," and recently worked a good deal at the South African *Iridaceae*, including a critical review of those of Thunberg's herbarium (Journ. Linn. Soc. Bot. 48, 15-55 : 1928). He was always keen to see Thunberg's specimens on which so many South African species are based, and he published notes on *Aloe* and *Mesembryanthemum* as represented in that herbarium.

Besides his botanical work Brown was a keen microscopist, and was a member of the Quekett Microscopical Club. In the Club's journal for 1914 he published "Some Notes on the Structure of Diatoms," and in 1920 in the "English Mechanic" a paper on "Some New and Old Antarctic Diatoms," whilst only last year, when 84 years of age, he brought out a small book containing an account of *Arachnoidiscus*, a genus of diatoms, consisting of 88 pages of descriptive matter and 7 plates (W. Watson & Sons, Ltd., London).

Brown was promoted to be Assistant Keeper of the Herbarium in 1909. He was elected an Associate of the Linnean Society in 1879, and in 1921 was awarded the Captain Scott Memorial Medal by the South African Biological Society in recognition of his work on the South African Flora. In 1932 the University of the Witwatersrand, Johannesburg, conferred on him the Honorary degree of Doctor of Science, the Director performing the ceremony at the herbarium in the presence of the staff (*K.B.* 1932, 155). A little before his death he was actually engaged on a monograph of the genus *Conophytum*, for which he had prepared a number of beauti-

fully executed coloured plates and dissections, for he was a very good botanical artist and could use colour with delicate effect. In his younger days he drew many of the plates for Mr. C. B. Clarke's "Illustrations of Cyperaceae."

Dr. Brown's taxonomic work was of a very high standard, and he paid great attention to small details. As the herbarium sheets show everywhere he was very critical, indeed almost hypercritical, in specific determinations. If anything were wrong with a drawing, a description or a determination in the herbarium, Brown would be sure to find it out. He could "spot" the family and genus of most plants, and was always very helpful to younger colleagues like the writer, who never appealed to him in vain. Although something of a recluse and chained to his science, whereby he accomplished much more than the average worker, Brown had a strong sense of humour and loved to "crack a joke." Even his pencil notes on the herbarium sheets show this. One, which he was fond of showing to visitors, is attached to a specimen of *Lecythis* from Demerara (*Jenman* 4155) named by J. G. Baker. On this sheet C. B. Clarke had written "Does this fruit really belong?" to which Brown had replied "This 'fruit' is a spider!" And so it is!

J. HUTCHINSON.

Plants in Flower on Christmas Day, 1934.—The following is a list of 103 plants which were in flower outside at Kew on Christmas Day, 1934. It is of interest to mention, by contrast, that the previous Christmas only one plant was in flower, namely *Jasminum nudiflorum*.

Abutilon vexillarium, *Anthemis Cupaniana*, *Arbutus Andrachne*, *A. andrachnoides*, *A. Unedo* varieties, *Armeria fasciculata*, *A. pungens*, *Bellis perennis* fl. pl., *Bergenia ligulata* var. *speciosa*, *Buddleja suriculata*, *Camellia noblissima*, *C. Sasanqua*, *C. Sasanqua* var. *alba*, Carnations, *Ceanothus Burkwoodii*, *Cheiranthus Cheiri* varieties, *Chimonanthus fragrans*, *C. fragrans* var. *grandiflorus*, *Clematis balearica*, *Colchicum libanoticum*, *Crataegus monogyna* var. *praecox*, *Crinum Moorei*, *Crocus Imperati*, *C. laevigatus*, *Cydonia lagenaria* (*japonica*), Daisies on lawns, *Daphne Laureola* var. *Philippii*, *D. Mezereum*, *D. Mezereum* var. *alba*, *Dianthus japonicus* var., *Dimorphotheca Barberiae*, *Erica carnea* varieties, *E. darleyensis*, *E. lusitanica*, *E. mediterranea*, *E. vagans* var. *grandiflora*, *E. Veitchii*, *Erodium Mourettii*, *Euphorbia biglandulosa*, *Forsythia suspensa*, *Fraxinus angustifolia*, *Galanthus byzantineus*, *G. Elwesii*, *Gerbera Jamesonii*, *Hamamelis japonica* var. *flavo-purpurascens*, *H. mollis*, *Helianthemum vulgare* var. (very few flowers), *Helleborus abschasicus*, *H. corsicus*, *H. cyclophyllus*, *H. foetidus*, *H. niger*, *H. odoratus* var. *purpurascens*, *H. orientalis*, *H. viridis* var. *purpurascens*, *Iberis Jordani*, *I. semperflorens*, *I. sempervirens*, *Iris unguicularis*, *I. unguicularis* var. *alba*, *Jasminum nudiflorum*, *J. primulinum*,

Kniphofia rufa, *Lonicera fragrantissima*, *L. Standishii*, *L. Standishii* var. *lancifolia*, *Mathiola incana*, *Parachetus communis*, *Petasites fragrans*, *Polyanthus*, *Potentilla splendens*, *Primula helodoxa*, *P. megascifolia*, *P. vulgaris* (and coloured varieties), *Prunus subhirtella* var. *autumnalis*, *Ranunculus millefoliatus*, *Rhododendron dauricum*, *R. dauricum* var. *sempervirens*, *R. lapponicum*, *R. Nobleanum*, "Mauve Queen," *R. mucronulatum*, *R. mucronulatum* var. *acuminatum*, *R. parvifolium*, *Rosa indica* var. *minima* and "Monthly Roses," *Salix Mendemii*, *Saxifraga Kellereri*, *Schizostylis coccinea*, *Senecio Crustii*, *Spiraea Thunbergii*, Stocks, *Veronica angustifolia*, *V. Cookiana*, *V. salicifolia*, *V. speciosa* varieties, *Viburnum fragrans*, *V. shensianum*, *V. tomentosum* Lanarth var., *V. Tinus*, *V. rhytidophylloides*, *V. rhytidophyllum*, *Viola* (winter-flowering hybrids).

Hooker's Icones Plantarum.*—Part 2 of vol. 3 of the fifth series was published in November last and contains 25 plates in black and white, each showing dissections, together with full descriptions and notes, of rare or little-known plants, 10 being new to science.

The first four plates are based on material collected by Messrs. Alston and Sandwith during their expeditions to South Macedonia and Albania in 1932 and 1933. *Silene Asterias* Griseb. (t.3226) is a very distinct species with a long-pedunculate capituliform cyme of deep crimson flowers, and is endemic in the central parts of the Balkan Peninsula. An origin by ecotypical segregation from the more widely dispersed *S. compacta* Fisch. is postulated. *S. ventricosa* Adamović (t.3227) is a dioecious species allied to *S. Roemerii* Friv. and *S. Sendtneri* Boiss. and together with them forms a group of species not sharply distinguishable from one another. *Lychnis subintegra* (Hayek) Turrill, status novus (t.3228), is based on *L. Flos-cuculi* Linn. subsp. *subintegra* Hayek; the collectors state that it is very distinct in the field from *L. Flos-cuculi*, with which they never found it associated. *Stachys serbica* Panč. (t.3229) is endemic in the central region of the Balkan Peninsula and is a native of the natural open woodlands, whose destruction by man may account for its relative rarity.

Three Australian grasses are illustrated:—*Homopholis* C. E. Hubbard (t.3231), a monotypic genus recently described from Queensland and allied to *Leptoloma* Chase; *Oryza australiensis* Domin (t.3232), a wild rice of perennial habit from Northern Australia and Queensland; and *Lepturus geminatus* C. E. Hubbard (t.3233), a new species allied to *L. repens* R. Br. A key is given to the four species of *Lepturus* so far recorded from Australia.

* Hooker's Icones Plantarum; or figures, with descriptive characters and remarks, of new or rare plants, selected from the Kew Herbarium. Fifth series. Edited for the Bentham Trustees by Sir Arthur W. Hill, K.C.M.G., Sc.D., F.R.S., Director, Royal Botanic Gardens, Kew; Honorary Fellow of King's College, Cambridge. Vol. 3, part 2 (London, Dulau & Co., 1934). Price 10s.

Sorghum dimidiatum Stapf (t.3234) is an interesting species from the Sudan. A remarkable morphological character is found in the lower glumes of the sessile spikelets: whereas the upper half of the glume is thin and chartaceous, the lower half is much thickened and cartilaginous. Most of the species of *Sorghum* have 20 (=2n) chromosomes, while *S. halepense* has 40; *S. dimidiatum*, on the other hand, belongs to a small group of about 8-10 species spread from the Transvaal to the Sudan, India, China, Malaya and Australia, the three species of which hitherto examined cytologically have only 10 chromosomes.

Botrychium chamaeconium Bitter et Hieron. ex Bitter (t.3235) is a tropical African fern so far recorded only from the Cameroons Mountain and Mt. Elgon, Uganda, though it will probably be found in other mountain masses in tropical Africa.

Five species of tropical African orchids are included:—

Cynorchis parva Summerhayes (t.3236), which extends from French Guinea to British Cameroons; *Habenaria Tweedieae* Summerhayes (t.3237), from Kenya Colony and Uganda; *Platycoryne megalorhyncha* Summerhayes (t.3238), a native of Southern Nigeria; *P. ambigua* (Kraenzl.) Summerhayes (t.3239), from Tanganyika Territory; and *Satyrium fimbriatum* Summerhayes (t.3240), endemic in Kenya Colony, but most closely allied to *S. membranaceum* and *S. princeps* from the Cape Province of South Africa.

Three new species of *Crotalaria* § *Sphaerocarpae* are described from Northern Rhodesia: *C. annua* Milne-Redhead (t.3243), *C. praecox* Milne-Redhead (t.3244) and *C. streptorrhyncha* Milne-Redhead (t.3245). *Bolusia resupinata* Milne-Redhead (t.3246) is a very remarkable Leguminous plant from the same country; the flowers are inverted owing to the bending back of the pedicels of the solitary flowers, and the carina, which is spirally coiled, is 2 inches long when straightened out. The genus *Bolusia* appears to be closely related to *Crotalaria* subsection *Stipulosae*, and has accordingly been transferred from the tribe *Galegeae*, in which it was originally placed by Bentham, to the *Genisteae*.

Two new species of *Leguminosae*, *Nissolia Hintoni* Sandwith (t.3248) and *Platymiscium lasiocarpum* Sandwith (t.3249), are described from the Temascaltepec district of Mexico, where they were discovered by Mr. G. B. Hinton, whose collections in this district already amount to over 6500 numbers.

Other plants described and figured are: *Micromeria formosana* Marquand, sp. nov. (t.3230), the only representative of the genus in Formosa; *Ixora hippoperifera* Bremekamp, sp. nov., from the Cameroons, a Rubiaceous shrub with remarkable saddlebag-shaped pouches at the base of the leaves, probably in connection with myrmecophily (t.3241); *Pygmaeothamnus conrescens* Bullock (t.3242) a native of grassland in Tanganyika Territory; *Rhadamanthus urantherus* R. A. Dyer, sp. nov., (t.3247), a bulbous plant from the Cape Province, South Africa, with anthers dehiscing by pores; and *Rhynchospora confusa* Ballard (t.3250), a perennial plant from

Goyaz, Brazil: this last was originally made the type of an independent genus *Syntrinema* Radlk. et H. Pfeiff., partly on the ground of characters which had been inadvertently taken from another genus of *Cyperaceae*, namely *Chorisandra*.

Gardening in East Africa.*—This attractive and practical handbook has been published, primarily to meet the needs of the horticultural community in East Africa, but also to be of assistance to all amateur horticulturists in the sub-tropics. Although written expressly for amateurs, there is much in it that will appeal, and be of assistance, to the professional gardener.

The editor, Dr. Jex-Blake, has had the assistance of several government officials as well as members of the Kenya Horticultural Society. Considering the number of contributors, it is surprising how uniform it is—a happy result of co-operation between the editor and his co-workers.

There are twenty chapters, including such subjects as climatic conditions, soil and tillage, propagation, annuals and perennials, flowering trees and shrubs, climbing plants, lawns, vegetables and fruit, and insect pests and diseases—an ever-present menace wherever horticulture is practised.

The contributors have in every case dealt with their subjects in a clear, concise and practical manner. Where all are so good it seems invidious to draw attention to any particular chapter or chapters, but one would like to mention specially those dealing with indigenous plants—so often neglected in gardens—and with climate, soil and cultivation. Particulars of the climatic conditions are of prime importance, not only to the intending planter, but also to anyone at home who is called upon to give advice and furnish lists of plants that are likely to succeed in any particular part of the tropics or sub-tropics. The chapter on "Gardens at the Coast" is valuable as showing what can be done under very difficult soil and climatic conditions, while that on "Gardening in Uganda" indicates clearly the difference between conditions obtaining there and in Kenya.

The book is well printed on good paper and there are six coloured illustrations of native plants, including an attractive "landscape portrait" of *Spathodea nilotica*, the Uganda flame tree. The foreword by Sir Arthur Hill is one which all who are interested in the cultivation of plants should "read, mark, learn and inwardly digest."

* By Members of the Kenya Horticultural Society and of the Kenya and Uganda Civil Services. Edited by A. J. Jex-Blake, M.D. (Oxon.), F.R.C.P. (Lond.). With a Foreword by Sir Arthur W. Hill, K.C.M.G., F.R.S., Director of the Royal Botanic Gardens, Kew. Longmans, Green & Co., 1934. Pp. xvi+330, 6 coloured plates. Price 12s. 6d.

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